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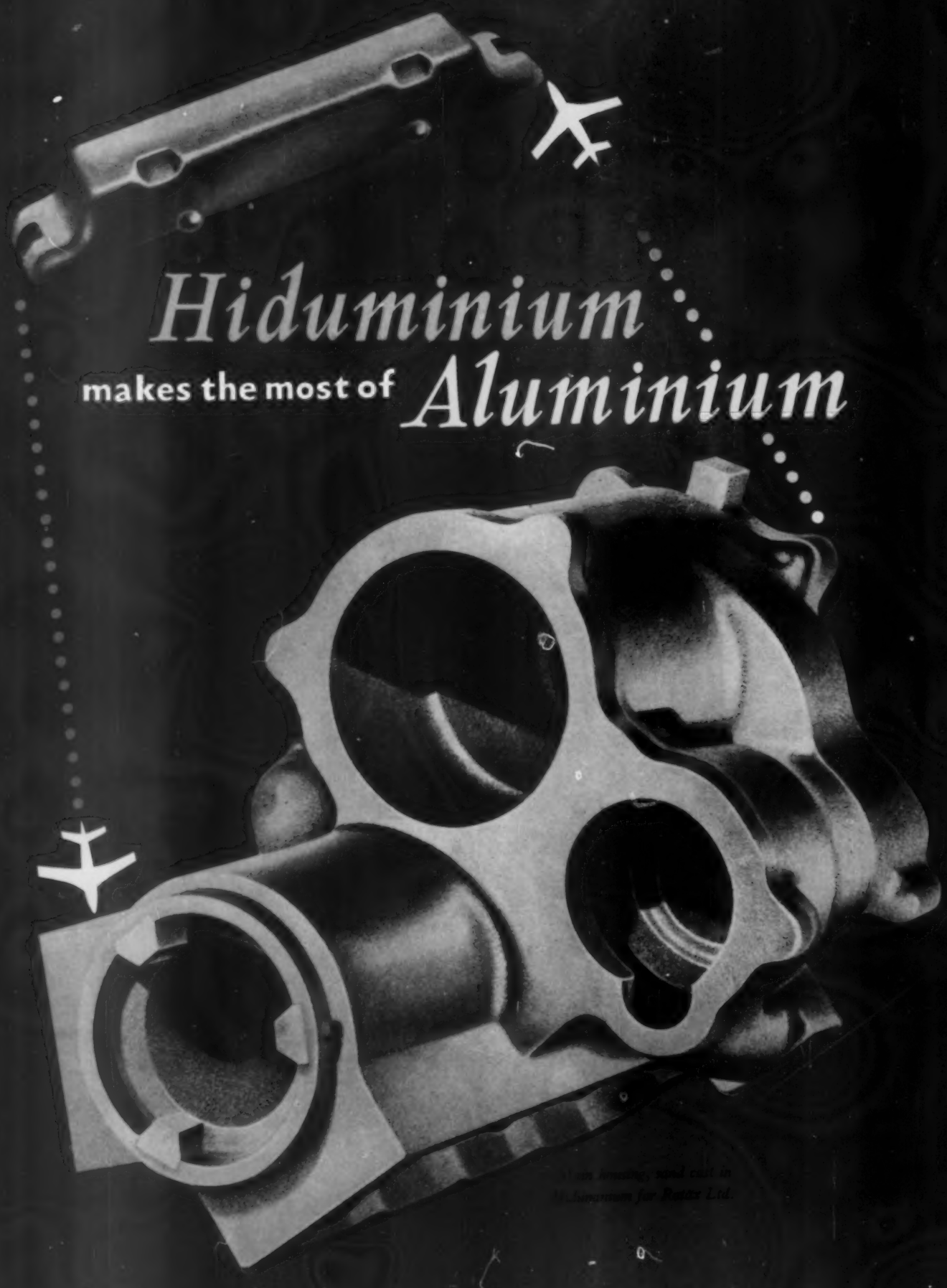

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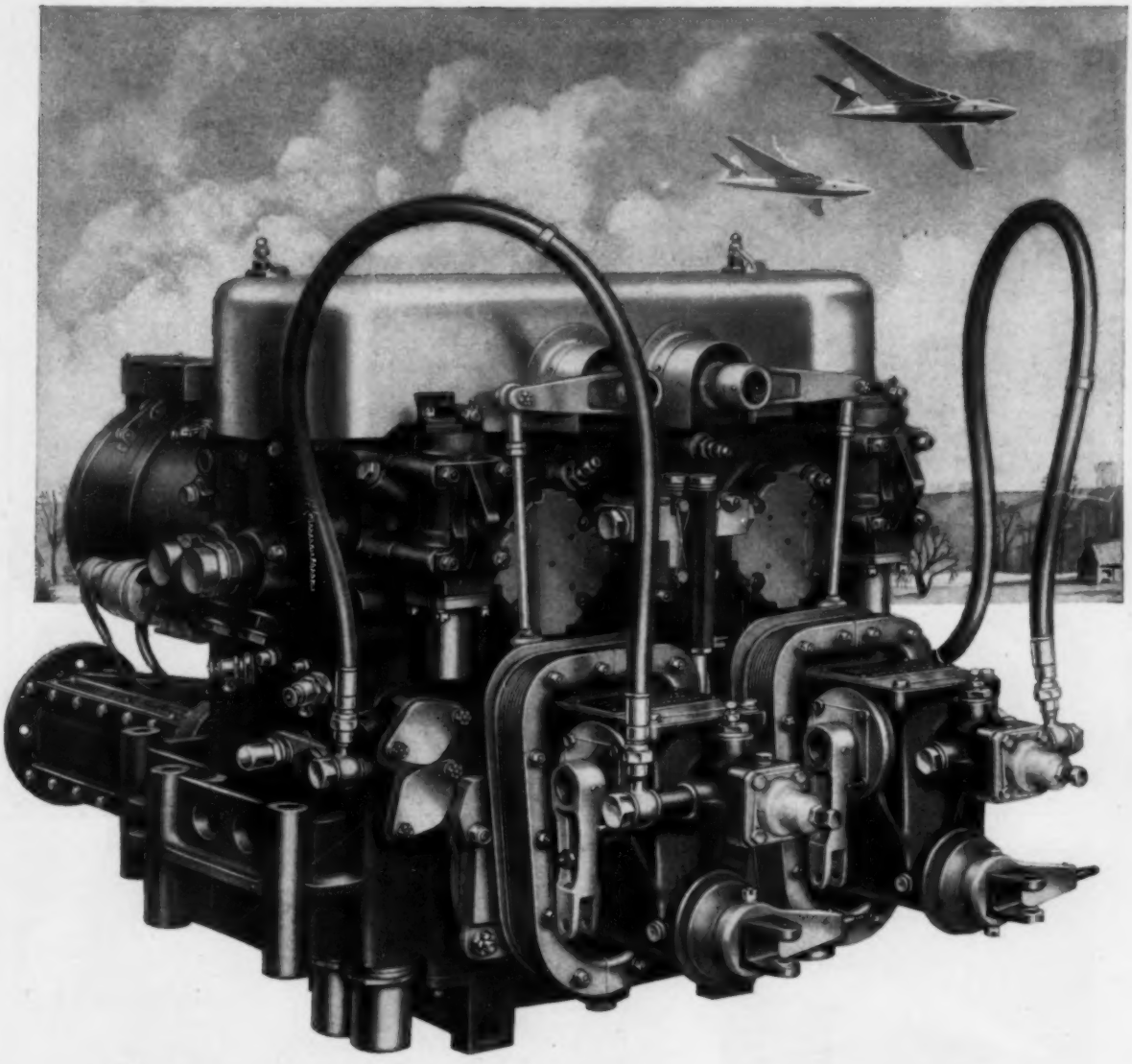

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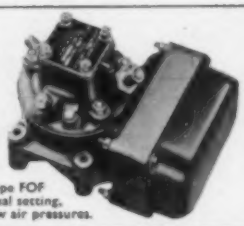
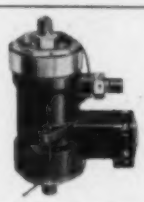
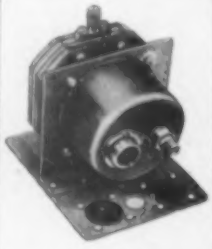
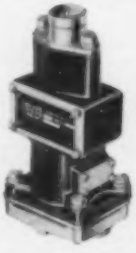
Type PAC Mach Number.


Type FOF
Dual setting,
low air pressures.

Type PAD Altitude.


Type FGY Fuel pressure.


Type FKK
Differential air pressure.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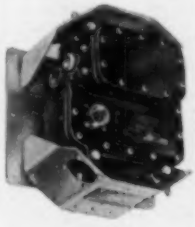
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Type FGW Ram air pressure

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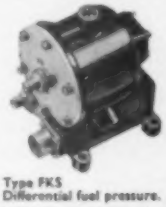
Type FKS
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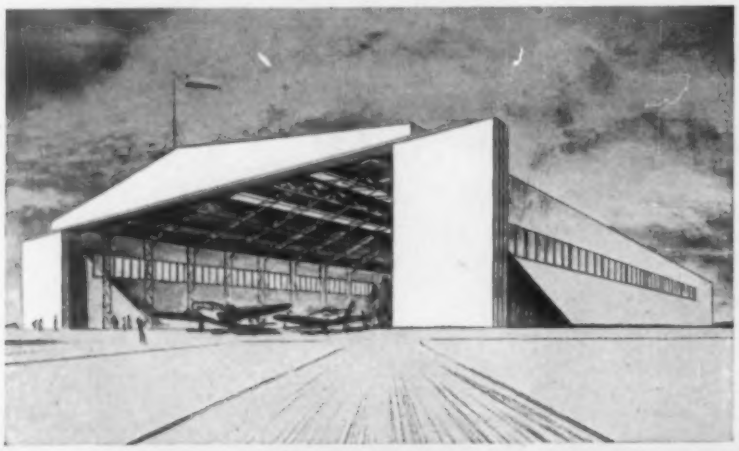

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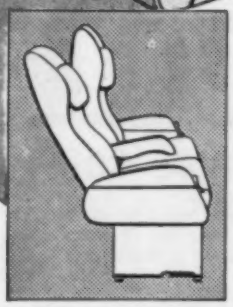

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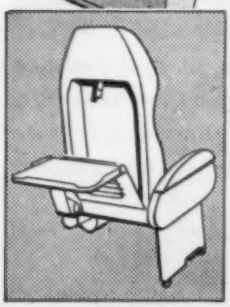

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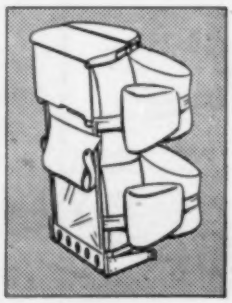

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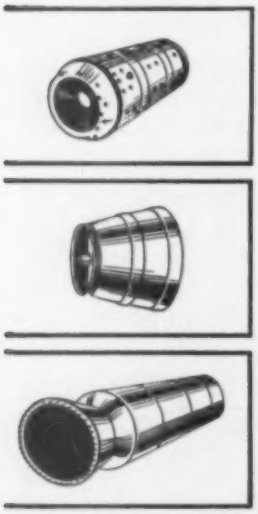

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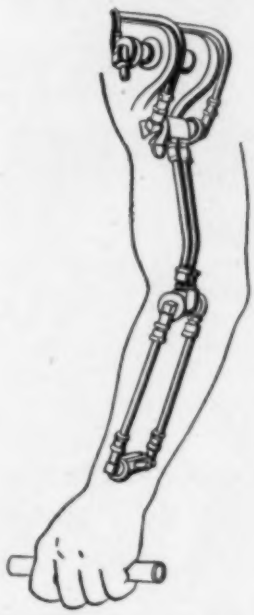

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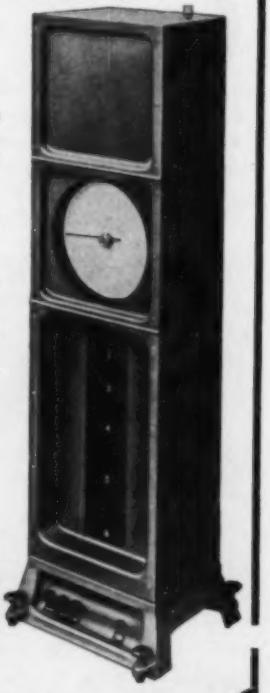

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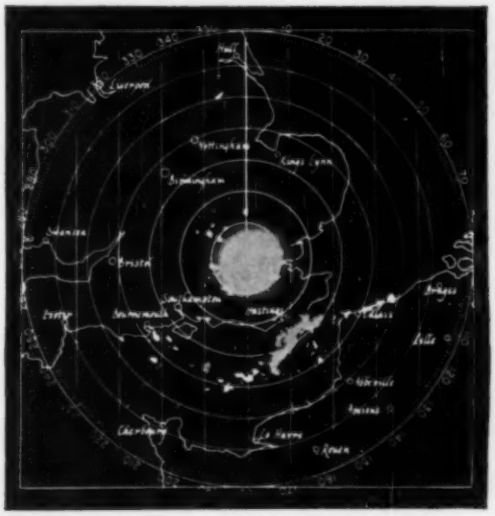

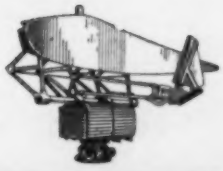

This actual picture, taken at the Meteorological Office from the Decca Type 41 Radar installed at the Air Ministry, Kingsway, shows heavy storms moving across the English Channel—on the 130 mile range scale.

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FLIGHT
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AIRCRAFT ENGINEER

No 2453 Vol 69 FRIDAY 27 JANUARY 1956

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Forebodings—

INFIRM policies, cutbacks and cancellations are favourite topics of the day among the melancholics. The winding up of the V.1000 project and the probable lopping of the Coastal Command Seamews (the Dismal Jimmies give us their word) are straws in the chill wind of recession; and far worse (we have their earnest assurance) is yet to come. The most distressing aspect is that their prognostications are buttressed in some degree by last week's Admiralty announcement that the contract for Bristol 191 anti-submarine helicopters is to be cancelled in favour of anglicized Sikorsky S-58s.

The Admiralty declare that, being smaller, the S-58 is better suited to the Navy's requirements; thus the cancellation can only meet with approval, for there is no greater embarrassment to a modern fighting Service than unsuitable equipment. At the same time, it is deplorable that the discovery should have been made, or at least announced, after so long a period (the order was placed in 1954) and when much technical effort had been directed towards the project, for the fuselage was shortened and the undercarriage completely redesigned to meet deck-handling requirements. Happily, development of the R.A.F.'s general-purpose transport version—a type which will have a promising civil counterpart—goes forward.

Rumours that yet another anti-submarine aircraft—the shore-based Shackleton M.R.3—was to suffer the same fate as the Naval 191 brought forth a prompt rebuttal from Avro; nevertheless, a feeling persisted that the months ahead will see more than one military contract reduced (the Valiant and Hunter have been named) and expenditure on aircraft and missiles carefully scrutinized. One writer has gone so far as to declare that the Navy, Army and R.A.F. missile programmes have already been ruthlessly slashed and that more than two-thirds of the projects have been scrapped or frozen until further notice, in recognition of the fact that "far too many firms have been allowed to take on more than they could manage and have made profits out of all of them—even those which flopped."

The only official comment was that of the Air Ministry—"It is too early to say what alterations to the programme will result."

Whatever the year may hold, this journal now takes the privilege and pleasure of digging the gloom-mongers sharply but cheerfully in the ribs, and affirming its faith that there will be no catastrophic visitation upon the aircraft industry at large.

—and Portents

AMERICA'S defence plans for her coming financial year were outlined last week in an awesome "atomic" budget laid before Congress by President Eisenhower. Providing for an increase of nearly a thousand million dollars in military allocations, it called for the doubling of expenditure on guided missiles; accelerated production of the B-52 inter-continental bomber and F-101, F-104 and F8U supersonic fighters; the building of a sixth Forrestal-class carrier; and the development of a nuclear power plant for eventual installation in vessels of that type. Sixty-four per cent of the budget was declared to be for deterring possible aggression and strengthening international alliances, and it called for a continuing increase in the nuclear-weapon stockpile. Together with "the means of delivery," this stockpile was reaffirmed by the President to be the principal deterrent to armed aggression in the world.

Thus, on one side of the Atlantic we have military aircraft and missiles threatened with substantial excision, while on the other the orders mount, the tempo of production quickens, and development drives forward under a tremendous financial impulse.

FROM ALL QUARTERS

Military Orders Reviewed

SOME reductions in existing orders for aircraft for the R.A.F. and Royal Navy are expected to be revealed when the Defence White Paper and the Air and Navy Estimates are published next month. It has already been inferred that the number of Short Seamews for R.A.F. Coastal Command may be cut back and it is likely that future production of the Hawker Hunter and Vickers-Armstrongs Valiant will also be somewhat reduced. It has been suggested that production of the Shackleton MR.3 is to cease, but this is denied by Avro; orders for this aircraft, both for the R.A.F. and S.A.A.F., are being fulfilled as planned.

The Admiralty, however, have cancelled their order for twin-engined, twin-rotor Bristol helicopters and it is likely that this role will be filled by a Westland-built variant of the Sikorsky HSS-1, the U.S. Navy version of the S-58. The Admiralty state, "it has been found that a smaller helicopter would be more suitable for operating from aircraft carriers and other ships for the anti-submarine role." Present HSS-1s are powered by a 1,500 h.p. Wright piston engine driving a single rotor, and are capable of lifting a useful load of some two tons. The type is already coming into service with the U.S. Navy and, in different forms, with the U.S Air Force and Army.

Bristol Aircraft recently moved all their helicopter work to Weston-super-Mare where production of a twin-engined general-purpose machine for the R.A.F. will go ahead. Initially powered by piston engines, these aircraft are expected to develop into a more powerful machine powered by such engines as the Napier Gazelle or other types of gas turbine.

New Aircraft and Engines

NEW aircraft designations officially disclosed are: Valiant B(PR)1 and Hunter T.7. Both aircraft are powered by Rolls-Royce Avons. The official designation of the Rolls-Royce Flying Bedstead (two Nene) is given as "Rolls-Royce Jet Control Research Unit", and it is disclosed that the power units installed in the Deflected Jet Meteor (converted by Westland Aircraft, Ltd.) are Nene RN.4s. Among new engine designations are Avon RA.30 and Tyne RTy.1. It is further revealed that the power rating of the Armstrong Siddeley Mamba ASM.6 is 1,650 s.h.p. plus 320 lb thrust. Three Orpheus ratings are as follows: BOr.1, 3,285 lb thrust; BOr.2, 4,520 lb; and BOr.3, 4,850 lb. Conways RCo.2, 3 and 5 are respectively rated at 9,250 lb, 11,500 lb and 13,000 lb.

TECHNICAL TRAINING as given at the College of Aeronautical and Automobile Engineering, Chelsea, was seen last week by the Minister of Education, Sir David Eccles. He is shown (left) with the Principal, Mr. G. D. Duguid (centre) and one of the instructors. There are over 400 students at the college, and more than 250 of them are from 50 different countries abroad.

RESTORATION: As we reported last week, St. Clement Danes, London, is to be rebuilt as a central church for the Royal Air Force. Seen examining the structure (which was destroyed by an incendiary bomb in 1941) are, left to right, Canon A. S. Giles, Chaplain-in-Chief, R.A.F., Mr. W. A. S. Lloyd, the architect, and A. V-M. Cecil Bouchier, who is directing the appeal for funds.

New M.o.S. Senior Appointments

IT is announced that the Minister of Supply, with the agreement of the Secretary of State for Air, has appointed A.V-M. W. A. Opie, C.B., C.B.E., to be Principal Director of Aircraft Research and Development (Royal Air Force). A.V-M. H. D. McGregor, C.B., C.B.E., D.S.O., has been appointed Assistant Controller of Aircraft in succession to A.V-M. Opie, and A. Cdre. B. A. Chacksfield, C.B.E., has succeeded A.V-M. McGregor as Director of Guided Weapons (Trials).

Guided Weapons Pronouncement

IT is reported from Australia that Dr. W. H. Wheeler, head of the Ministry of Supply's staff in that continent, has said that guided weapons would probably have replaced conventional weapons within ten years. Speaking at Perth, Dr. Wheeler said he believed it would not be long before such weapons were fired from Woomera range, across Australia into the Indian Ocean. It was unlikely, however, that they would be fitted with atomic warheads. As far as was known, no country had ever fired a guided weapon carrying an atomic device.

Dr. Wheeler has been associated with rocket development in Great Britain since it began nearly twenty years ago, and for some years was Director of Guided Weapons (Research and Development) at the Ministry of Supply. Apart from his Ministry of Supply duties in Australia he is also to act as scientific adviser to the British High Commissioner.

Three-Nation Naval Exercise

AIRCRAFT were co-operating with ships of the Home Fleet which sailed from Portland for Gibraltar last Friday at the beginning of their spring cruise and exercise programme.

Coastal Command Sunderlands, Shackletons and Neptunes based in the United Kingdom and Gibraltar, and French and Portuguese maritime aircraft, together with aircraft of the Fleet Air Arm, co-operated in the exercise, which embraced the location and tracking of submarines, refuelling at sea and NATO methods of operating aircraft and ships.

Vessels engaged included the Training Squadron aircraft carriers *Theseus* and *Ocean* and ships drawn from the Home Fleet Flotilla Command: the cruiser *Glasgow*, two Daring-class ships, several destroyers, and frigates and submarines.

Canada and Canadair

THE president and general manager of Canadair, Ltd., Mr. J. Geoffrey Notman, has said in a New Year review that, although complete figures for 1955 were not yet available with respect to Canadian air carriers, current records portend a consistent upward trend. Preliminary estimates indicated that about 2,700,000 passengers were carried in 1955 (compared with fewer than 50,000 ten years earlier) as well as some 200 million pounds of freight and 36 million pounds of mail. There were now, said Mr. Notman, about 500 licensed airports in Canada, some 750 transport aircraft in commercial service, and nearly 2,800 com-

mercial pilots. Private aircraft totalled 1,300 and there were 5,000 private pilots.

The number of plants manufacturing aircraft and components now totalled 55, employing not far short of 40,000 people (with another 12,000 employed by the carriers), and paying wages and salaries running into some $136m annually in the manufacturing plants and more than $47m among the carriers.

Mr. Notman added that the aircraft industry had become, over recent years, a truly major element in Canada's industrial economy, extending its benefits through the establishment of strong secondary industries by sub-contracts. Canadair might be taken as an example of the industry, he said, and he went on: "We have had an average employment figure during 1955 of 8,000, with gross wages and salaries amounting to $31,200,000 on an annual basis. In the past year, we invested nearly $3,500,000 in capital expenditure for new buildings, additional engineering and tooling facilities, and machines. We continued during 1955 to produce our F-86 Sabre, of which we have now turned out more than 1,400, and of which more than 1,000 are now serving in Europe with 12 overseas squadrons of the R.C.A.F., as well as with the R.A.F. We continued, also, to produce our Silver Star jet trainer and have now turned out more than 500."

Mr. Notman said that the first of a considerable number of rear fuselages for the Royal Canadian Navy's new anti-submarine aircraft, the Grumman CS2F-1, were produced during the year by Canadair as sub-contractor for the de Havilland Aircraft Co. of Canada, Ltd., which held the main contract. Much development work had been done at Canadair on guided missiles. Another major enterprise carried on last year was the advanced tooling and development work on Canadair's CL-28, the redesigned Bristol Britannia to meet R.C.A.F. requirements for maritime reconnaissance. Canadair had also entered the field of nuclear energy.

Avro Blow-Down Tunnel

PLANS have been approved for a supersonic wind tunnel for A. V. Roe and Company, Ltd.; it will be built alongside the company's existing tunnels at Woodford, Cheshire.

A 500 h.p. drive will suffice for supplying compressed air to a 40ft-diameter sphere charged to 115 lb/sq in absolute. Test runs will generally be of approximately one minute's duration. The working section will be 27in by 30in and will be preceded by a flexible nozzle, with the aid of which infinite Mach variation will be obtained over the range M = 1.5 to 3.5.

The expected cost is approximately £100,000 and the new installation will handle all preliminary design and development testing, leaving one or two major series of tests on finalized designs to be made in Government tunnels. We expect to publish a description of the new tunnel in an early issue.

Kenya's First Air Show

Ten Thousand Spectators at Kitale: An Eye-witness Account

(Left) Messrs. Warren Holder and Fitz-John in control. The tower may have been a little primitive, but it nevertheless had radio installed by International Aeradio (E.A.), Ltd. (Right) Local colour.

THE Kenya Air Show, held at Kitale on January 7th and 8th, was the most ambitious ever attempted in East Africa. The Royal Air Force, civil airlines and charter companies, and owners of private aircraft worked together in the closest co-operation to produce a splendid flying display which (writes a correspondent) 10,000 residents of Kenya—European, Asian and African—are unlikely to forget.

The suggestion that the usual air rally should be extended into a real air show was put by Capt. Norman Waugh (war-time Atlantic ferry pilot and post-war airline pilot) to the committee of the Trans-Nzoia Flying Club at Kitale, an "up-country" town 200 miles from Nairobi, in the heart of a heavily populated farming district. His proposal was enthusiastically received by Mr. Frank Humphris (chairman), Mr. Tom Ashworth (secretary) and the members of the club, and their hard work culminated in a miniature Farnborough which won great appreciation from the Kenya people. In addition to the flying display, more than thirty trade stands were put up by airline offices, travel agents and companies associated with aviation, many of the stands being of a quality which would have done credit to Farnborough itself. This was, indeed, the first time that trade stands have been a feature of an air show in Africa.

Weather was cloudy, with a sharp rain squall on the first afternoon, but this did not in any way deter the pilots from putting on some first-class flying. This little up-country airfield has a grass runway of 1,800 yd. and another of 600 yd. There being no radio facilities, Mr. Fitz-John, of Air Traffic Control, Nairobi, brought up a flying-control van from which he and Capt. Waugh very ably managed operations. An excellent commentary was broadcast throughout by Mr. Roy Usher of Airspray (E.A.), Ltd.

The show was opened by the Deputy Governor of Kenya, Sir Frederick Crawford, K.C.M.G., C.B.E., who, in his speech, referred to the history of aviation in Kenya which, he said, "was written less than 30 years ago when a de Havilland D.H.51 became airborne over Kenya. This same aircraft, VP-KAA, is to show us its paces today . . ." The first form of public air transport to be provided by Wilson Airways in 1929 was a Gipsy Moth. But from this small beginning, Wilsons built up a fleet of twin-engined aircraft which, by 1939, were covering over a million miles a year.

Referring to the pioneers of aviation in East Africa, Sir Frederick went on to say: "It is in a great measure due to the efforts of these early pioneers, who flew in all weathers and without radio aids, that we have today a highly efficient network of air services throughout East Africa operated by our own airline from 44 different airfields. We also have charter companies which are doing a most essential job of work, and we have the Kenya Police Reserve Air Wing, which has proved itself time and time again during the emergency and is, I am glad to say, here to stay."

Sir Frederick also paid tribute to the Aero Club of East Africa, which was formed in 1927, and which has done a very great deal to foster and encourage private flying. The Deputy Governor concluded by saying that he had no doubt that the Show would be a further contribution to the development of aviation in East Africa.

The first event was a fly-past in single formation of all but the jet aircraft, introducing the pilots. This was closely followed by one of the most eagerly awaited events of the day—formation flying by three Mk 4 Venoms from No. 8 Squadron based at Aden and flown by S/L. A. J. Houston, F/O. J. B. Munro and F/O. E. T. Dunn. They gave an impeccable display of formation aerobatics—double loops and barrel rolls, low, fast runs and steep turns, finishing their display with a spectacular "ding"—a very fast dive over the airfield, breaking away at right angles to the leader.

On the Sunday afternoon the show was "made" for the public when S/L. Houston landed his Venom on the grass strip—immediately to disappear, as he parked outside the control tower, under a crowd of autograph hunters from the Trans-Nzoia Flying Club. S/L. Houston eventually took off again, to thrill the onlookers with a farewell low fast run culminating in a very fast climb and several beautiful rolls as he disappeared into the clouds.

It is not easy to follow such a performance with a piston-engined aircraft, but Capt. E. Boscovic, manager and chief pilot of Campling Bros. and Vanderwal, Ltd., gave a fine demonstration of the

The crew of the Canberra from No. 10 Sqn: (left to right) F/O. T. A. Hoare, navigator; F/O. R. T. Hayward, pilot; F/O. A. C. Wilson-Pepper, observer. (Right) The D.H. 51 "Miss Kenya," born 1925, was demonstrated by Mr. J. S. le Poer Trench, who is seen standing alongside.

KENYA'S FIRST AIR SHOW . . .

six-seater Italian Macchi, flying low across the airfield with one engine feathered, followed by a low run at maximum engine speed and a stall turn.

The Kenya Police Air Wing, who were to have followed the Macchi, had to cut their performance owing to the fact that all their aircraft were in operation against one of the few remaining Mau Mau gangs on the borders of Lake Naivasha. Next on the programme was formation flying and aerobatics in two D.H. Chipmunks, flown by G/C. G. Edge, O.B.E., D.F.C., and F/L. J. Mudd—both instructors at the Trans-Nzoia Flying Club—the public following their every movement as they looped, rolled and stall-turned over the airfield. The two pilots seemed, in fact, reluctant to come down to make way for the next big event of the afternoon—the English Electric Canberra. This aircraft, a Mk B.2 of No. 10 Sqn., was sent from its base in England to Kenya for the show, and arrived *via* Aden in 11 hours' flying time, its speed being somewhat hampered by wing-tip tanks.

The crew, F/O. R. Hayward (pilot), F/O. T. Hoare (navigator) and F/O. A. Wilson-Pepper (observer), are members of No. 10's formation team which has been selected to represent Bomber Command at national and international aeronautical functions during the coming year. The aircraft drew a tremendous roar of approbation from the crowd as it flew over in a series of fast low runs, followed by a run with bomb bay open, another with wheels down and a third with flaps down. On the final fast vertical climb-away the power levers were suddenly cut, with a resultant "deathly hush" after the deafening roar.

Following the Canberra came a D.H. Dove, a V.I.P. aircraft owned by Williamson Diamonds, Ltd., and flown by Capt. Croft, D.F.C., exhibiting fast and slow runs with one and both engines. It is interesting to note that Williamson Diamonds have five aircraft based on their mine in Mwadui in Tanganyika—a Dakota and two Doves for passengers and freight, a Cessna 180 for special short runs, and a Chipmunk belonging to their flying club.

East African Airways sent along a Dakota, piloted by Capt. D. R. Bird, which carried out a series of low runs with and without an engine feathered.

Next came an event of particular interest to the crowd, having come about as a result of the emergency in Kenya. This was a demonstration of "sky shouting" by a Hunting Percival Pembroke of the Royal Air Force, piloted by F/L. R. H. Anders. The technique is used in operations against bandits in both Kenya and Malaya with considerable success. The door of the Pembroke is removed and four loudspeakers are mounted in the opening. [A photograph of the installation appeared on p. 67 last week.] The aircraft flies in a fairly steep turn, so that the speakers are directed downwards. Messages are broadcast through the speakers —either *via* a tape recorder or by direct transmission—to gangs operating in the country below. In Kenya a native District Officer is often carried in the aircraft to broadcast a direct message to a particular gang, and many gang leaders and Mau Mau have given themselves up as a result. Directly before appearing at Kitale, this very aircraft had been in operation against one of the few remaining Mau Mau gangs in the Naivasha area of the Rift Valley.

Capt. B. I. Morris of Airspray (East Africa), Ltd., in a Cessna 180, followed the sky-shout with another performance of particular

Kitale's thatch-roofed static show, with 30 stands, drew plenty of visitors. (Right) The three Venoms give their aerobatic display.

The Venom pilots of No. 8 Sqn., who contributed formation aerobatics: (left to right) F/O. J. M. B. Munro, F/O. E. T. Dunn, S/L. A. J. Houston, F/O. Carroll, F/O. Perryman. The two last-named had to withdraw at the last moment, owing to indisposition, physical and mechanical.

interest to Kenya farmers—crop dusting and spraying. His aircraft was fitted with a rotor spraying gear and a crop duster, and his demonstration consisted of low runs, both spraying and dusting, at an altitude which at times did not exceed two feet above ground level. His aircraft had recently finished spraying 13,000 acres of cereals in the Kinangop area, resulting in a booking for a further 37,000 acres. Another aircraft of the company has a year's contract spraying red locusts in the Abercorn district of Northern Rhodesia.

Two aircraft of Hunting Air Survey followed the crop spraying—a Vercival Prince, with reversible-pitch airscrews, flown by Capt. R. W. Brumwell and fitted with an R.C.5 camera, and a Dakota, flown by Capt. Donald Pearson, D.F.C., adapted for aerial survey at a height of 28,000ft. The latter aircraft, which is based at Kitale, is at present photographing 20,000 square miles for the Director of Colonial Surveys.

Messrs. Haward Maclachlan and Co., Ltd., next sent in a Piper Pacer from their air charter division, flown by Capt. D. Pharazyn, who demonstrated his aircraft's ability to do tight turns, and a slow run of 50 m.p.h. still under full control, finishing with a steep climb and a stall turn to land on the runway almost as soon as he had finished his climb. It was Capt. Pharazyn who started the Trans-Nzoia Flying Club in May 1952 with a Piper Cub.

The next aircraft, and one which received a warm tribute from the crowd, was the "grand old lady of Kenya," the D.H.51 *Miss Kenya*, built by de Havillands in 1925 and shipped out to Kenya in 1926, where she flew in April of that year. In her log-book the first name to appear is that of Capt. (now Sir Geoffrey) de Havilland, who test-flew her in 1925. Still in fine flying order, maintained and flown by Mr. J. S. le Poer Trench, of Airspray (E.A.), Ltd., she demonstrated her short take-off run by leaving—the wind having by now changed direction—across the runway, and was airborne long before she reached the opposite side. At a speed of approximately 70 m.p.h., this delightful veteran showed off her manœuvrability, gliding round in steep turns with effortless ease, showing no signs of fatigue after her flight from Nairobi, and landing again in a run of barely 100 yards.

A Cessna 180 of Campling Bros. and Vanderwal, Ltd., flown by Capt. J. R. Tuckwell, came over at a fast run, followed by a slow run of approximately 40 m.p.h. before climbing rapidly to a certain height, where it waggled its wings, and the public were asked to guess its height above the airfield, the prize being a bottle of whisky. This thirst-making event was followed by Mr. R. W. Morford of Macpherson, Train and Fenton, Ltd., who gave an impressive demonstration of the ability of the Pyrene Company's foam extinguishers to put out large fires of petrol and oil and of stacked wooden boxes filled with wood shavings and paper, and soaked in tar.

The final R.A.F. contribution followed the fire extinguishing—a Valetta of the East Africa Communications Flight, flown by F/Sgt. Hyland, A.F.M., with P/O. Tomlinson (navigator) and Sgt. Jones (signaller), dropped 12 S.E.A.C. packs to an imaginary police post delineated by a tent and smoke marker. The despatching team, headed by Sgt. Vessey, was made up of troops from the Army Air Despatch Detachment, Supply Depot, Kahawa. This aircraft, also, had been engaged in recent operations against Mau Mau, and it was obvious that crew and despatchers were in good training as their packs fell well within the target area.

The show was closed by Capt. Norman Waugh dancing to music in a D.H. Chipmunk (accompanied on the second afternoon by the writer of this report, who, after the first two minutes, felt that she would infinitely rather be dancing with Capt. Waugh on terra firma than waltzing through the clouds to the tune of the *Blue Danube*).

A prize of 50 gallons of petrol, donated by Caltex, was given for the best stand in the show, and won by Colin Hood Insurance (Aviation), Ltd., the runners-up being the R.A.F., with Vickers-Armstrongs and de Havillands tying for third place. B.O.A.C. presented a cup for the best individual demonstration, and this was won by Capt. Croft, D.F.C., flying the Dove from Williamson Diamonds, Ltd.; and another cup, presented by the Trans-Nzoia Flying Club for the best-turned-out aircraft, was carried off by Capt. E. Boscovic with his Macchi.

Everyone was agreed that the first Kenya Air Show was a tremendous success, thanks to the unflagging efforts of Capt. N. Waugh, Mr. Frank Humphris, Capt. D. Pharazyn and many other members of the Trans-Nzoia Flying Club. On all sides one heard expressions of appreciation to the Royal Air Force for sending over the first military jet aircraft to be seen in this part of Kenya, and of congratulations to the organizers for a varied and thrilling display, with the hope that this was but the forerunner of many Kenya Air Shows to come.

AUSTRALIA'S KEEN WOMEN PILOTS

AT the fifth annual general meeting of the Australian Women Pilots' Association in Melbourne recently, Mrs. Nancy Walton, founder and retiring president, reported an active year in which great progress, especially in the international field, had been made. Membership of the Association, she said, stood at 121, including one New Zealand member. The Evelyn Follett Trophy, for the most outstanding flying performance by a member of the Association, was awarded for 1955 to Mrs. Nancy Leebold for her solo delivery flight in a single-engined machine from England to Australia, and the winner of the 1955 Women's Air Reliability Trial was Miss Grace Cavanagh. Trophies for these events were presented at the meeting by Mr. Athol Townley, M.P., Minister for Air and Civil Aviation. Joint runners-up in the Reliability Trial were Mrs. R. G. Casey, patron of the Association, and Pat Redman. Successor to Mrs. Walton as president of the Association is Mrs. Nancy Leebold.

AIRCRAFT INSTRUMENTS IN ANTARCTICA

IN the two Mk 7 Austers accompanying the Trans-Antarctic Expedition are fitted standard Kelvin Hughes P12 aircraft compasses with special corrector boxes to allow for the greater "dip" or vertical component of the magnetic field in the extreme Southern regions. In addition, the Smiths directional gyros have been specially calibrated for the southern latitudes.

Each of the two Weasel land vehicles to be used on the ice-cap will carry a Kelvin Hughes E2 compass. Designed originally as emergency magnetic compasses for aircraft, these instruments have special correctors which will help to eliminate the vertical component of the Earth's magnetic field in extreme latitudes. The E2s are specially suitable for use at low temperatures as each one is tested before it leaves the makers' factory to function correctly at 40 deg below zero.

The master compass carried by the expedition is a standard Kelvin Hughes medium landing compass.

HERE AND THERE

NEPTUNE'S BIRTHDAY SUIT: This is the first Lockheed P2V-7 Neptune anti-submarine aircraft to be delivered to the U.S. Navy in its natural aluminium finish. By dispensing with the familiar deep-blue livery time and money are saved in both manufacture and maintenance.

P.1 Progress

THE English Electric Co., Ltd. stated last week that the first prototype P.1, which first flew in August, 1954, had now completed over 100 hours of flying. Work on the 20 pre-production aircraft was proceeding.

Australian Exchange

NINE officers of the Royal Australian Air Force are leaving for America at about this time for exchange duty with the U.S.A.F., and ten officers of the U.S.A.F. will be travelling to Australia to serve with the R.A.A.F. Among the Australians is W/C. R. F. Sharp, who has been in charge of flight trials at the Woomera range.

Geoffrey Tyson Entertained

TO mark his retirement from the post of chief test pilot to Saunders-Roe, Ltd., Mr. Geoffrey Tyson was guest of honour at a dinner given at Claridge's last week by Sir Arthur Gouge, vice-chairman of the company. Mr. Tyson was presented with a piece of silver plate from the chairman and directors, and Mr. J. Lankester Parker proposed his health.

Australia's C. and A. System

THE defence of Australia will be notably strengthened this year by the completion of a radar Control and Reporting System costing £A1m. The first station has just been completed near Sydney, and an air force spokesman has said that the system will be effective against jet aircraft flying at supersonic speeds at 50,000ft or higher.

Continental Industry Congress

THE second AICMA congress, representing the aeronautical industries of Belgium, France, Germany, Holland, Italy, Spain, Sweden and Switzerland, is to be held from September 25th-29th at Scheveningen, The Hague. The organizers this year are the Dutch, and the secretariat is situated c/o Nationaal Luchtvaart Laboratorium, Sloterweg 145, Amsterdam W.

BIG DAY: On January 18th, for the first time since the Provost-Vampire pilot-training scheme was introduced two courses were passed simultaneously—from No. 5 F.T.S., Oakington. Seen on that occasion are (l. to r.): F/O. R. W. Glover (distinguished pass, Cup of Honour, D.H. Flying Trophy); P/O. P. G. Padley (Cup of Honour, D.H. Flying Trophy, Ground School Trophy); P/O. R. H. F. Mearns (Aerobatic Trophy); P/O. M. B. Hawkins (Aerobatic Trophy); F/O. M. W. Knight (Ground School Trophy). The reviewing officer was Air Marshal Sir George R. Beamish, A.O.C.-in-C. Technical Training Command.

Hybrid

A FORMER senior technician of the Zeppelin works, Albert Simon, is reported to be developing a "water airship." It is described as resembling one of the old Zeppelins and being a cross between an aircraft and a ship; it is intended to operate from water and reach a speed of about 175 m.p.h.

Deaf Ground Crews

THE United States Navy is experimenting in the employment of deaf men as jet-aircraft ground crews. Tests are being made to find whether jet noise is capable of causing psychological harm to persons unable to hear it.

Denmark's Last Spitfire

THE Royal Danish Air Force, which is shortly to put into commission the first of a batch of Hawker Hunters, is to present its last Spitfire to the town council of Vaerloese for use in a children's playground. All other Spitfires on charge are to be broken up.

Pioneer's Fortune

GLENN L. MARTIN, the aviation pioneer and aircraft manufacturer, who died on December 5th, left more than $14¼m (about £5,090,000 sterling) apart from real estate holdings. The bulk of the estate is to be distributed to his next-of-kin, but his will provides for a grant of $2m (about £714,000) for an aeronautical research foundation at Maryland University.

De-dogged

IT is reported from Australia that the campaign for poisoning wild dogs in West Australia and Queensland, by means of poisoned meat dropped from aircraft, has been highly successful. The campaign has reduced wild dogs to the lowest number that sheep farmers ever remember.

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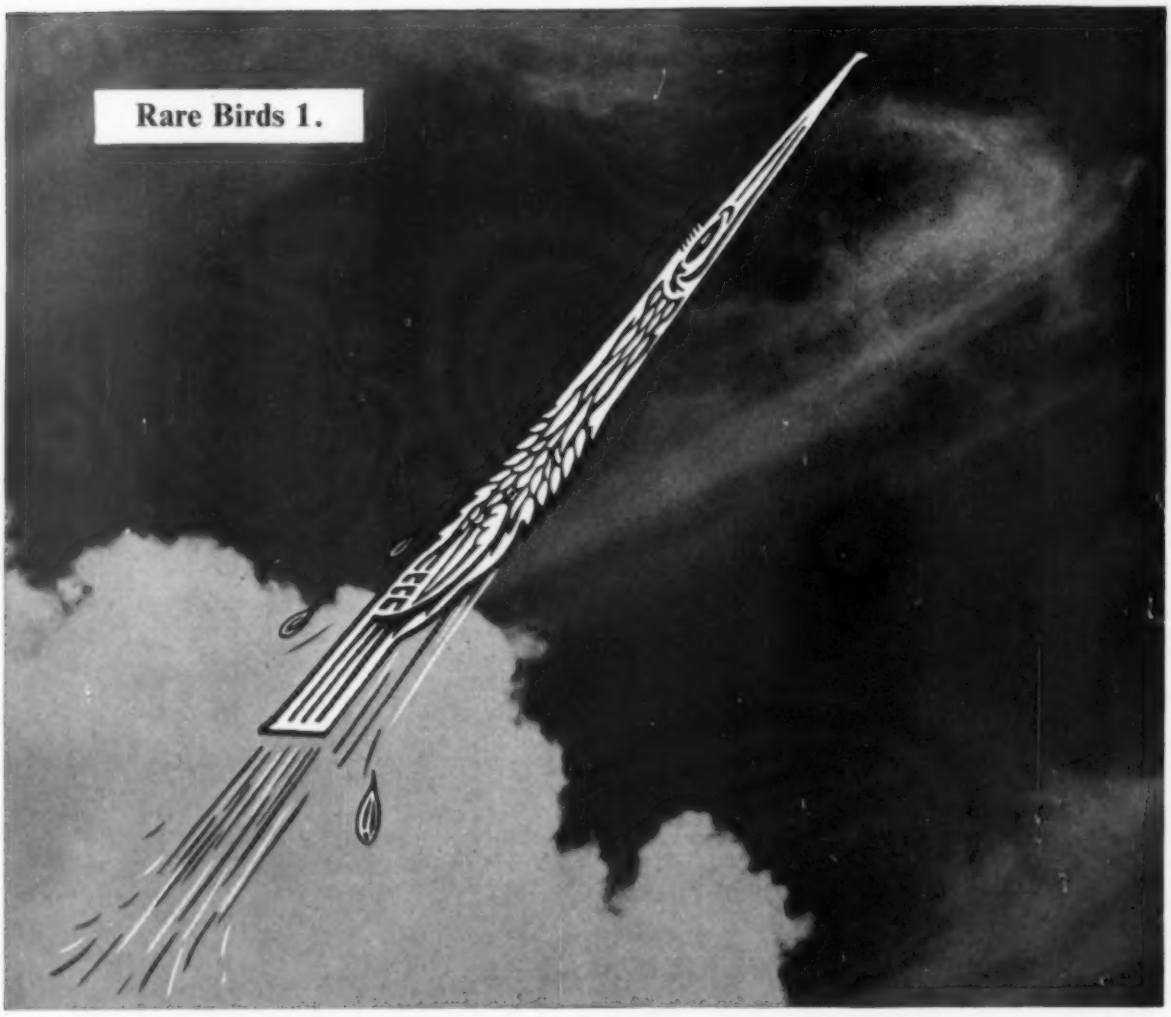

It is rumoured that . . . . . .

the Whooshing Bird, known to fly higher, faster and furiouser than any other Whooshing Bird before or since, is now flying much higher, faster and furiouser than ever. Indeed, he now gets by with almost no wings and propels himself to great heights by the most dubious methods. But vaulting ambition o'erleaps Whooshing Birds too and sooner or later they find themselves high, wide and upside down with everything on the clock and not quite sure how to keep it there. Luckily Whooshing Birds have a very high cluefficiency factor and know that they can trust in Irvin.

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GERMANY'S AVIATION INDUSTRY

A Personal Report—Part I

By FRANK ZIEGLER

ON May 5th, 1955, West Germany regained her sovereignty and a ten-year ban on aviation came to an end. During those ten years no powered aircraft or aero engine was allowed to be constructed on German soil, attempts by foreign countries to get components built in Germany under licence were vetoed by the Allied Security Board, and the only German pilots—glider pilots—flew, it was said, with their compasses in their pockets, because a compass was deemed to be an integral part of a powered aircraft! The old aviation firms either disappeared completely or beat their swords into ploughshares.

The ban, however, had something of the same effect as the similar ban after the 1914-18 war, when, by the secret clauses of the Treaty of Rapallo, certain German firms were given facilities to start afresh in Russia. While what was left of the industry in West Germany kept going in a small way by the manufacture of non-aviation products, Dornier and Messerschmitt opened offices in Madrid and, in conjunction with Spanish firms, began developing new aircraft which have since been flown; Fritz Siebel (since killed in an accident) built a small aircraft called the Siebel-Macchi in Italy; and Professors Kurt Tank and Heinrich Focke obtained contracts respectively with the Argentine and Brazilian governments. Moreover, soon after international talks began to make West Germany a member of E.D.C. or (when that failed) of NATO and the W.E.U., there were Germans who began to argue that a German aviation industry, however integrated with the industries of other countries, was a necessary contribution to European defence.

With the ending of the ban in sight, Dornier, Heinkel, Messerschmitt, Focke-Wulf, Daimler-Benz and (surprisingly) Junkers formed themselves over three years ago into a "working group" called Aero-Union, centred at Munich and with Prof. Claudius Dornier as president. About the same time a much larger body, including even the accessory manufacturers and called "Association for the Promotion of Aviation"—promptly changed on sovereignty day to "Association of the German Aviation Industry"—was formed, and, at the invitation of Prof. Leo Brandt, State Secretary of the North Rhine-Westphalian Government, established its headquarters in Düsseldorf. Its presidential committee consists of Dr. L. S. Rothe, former chairman of Junkers, Prof. Dornier, and Dr. Nallinger of Daimler-Benz. (Its general manager, Herr Kastner, commanded a bomber squadron in World War I, and in World War II was under sentence of death for insulting Hitler and Göring.)

This is the representative body with which the Federal Ministries of Defence, Finance and Economics will have to deal when German rearmament gets under way. In fact, the first official recognition by a German post-war government that a German aviation industry still potentially existed was the directive last September that individual firms should combine into operative groups in order to exploit most economically the available material and personnel resources for the modest programme of aircraft construction deemed necessary for the new embryo Luftwaffe—a programme greeted with as little enthusiasm by the German public as the decision to re-create German armed forces.

That such a re-grouping was necessary is clear when one remembers not only that most of the available factories were up to 60 per cent destroyed and up to 100 per cent dismantled, but that a large section of the former industry is now situated on the wrong side of the Iron Curtain. Arado no longer exists; Junkers is little more than a "paper" firm in Bonn under the trusteeship of Kurt Adenauer, the Chancellor's nephew; the former Heinkel empire is a mere remnant; while the equipment of still other firms which transferred their main production centres eastwards to escape Anglo-American bombing is now, ironically enough, beyond recall.

Here, then, is a survey, based on personal visits, of the existing former aircraft manufacturers, their new groupings, and their expected part in the provisional programme.

Group I ("North") consists of the following firms: 1, Hamburger Flugzeugbau (Blohm und Voss); 2, Finanz und Verwaltungsgesellschaft "Weser," Bremen—a post-war name for the former "Weser" Flugzeugbau; 3, Henschel und Sohn, Kassel; 4, Siebel Werke, Munich.

This represents quite a concentration of industrial power, for Nos. 1 and 2 were, and presumably will be again, the aviation branches of the two largest German shipbuilding concerns, which since the war have already put Germany second only to Britain in shipbuilding output; while No. 3, founded in 1825, is one of the largest producers of railway locomotives, buses, lorries and machine tools. For aircraft production Blohm und Voss, who made the famous seaplanes of the old Lufthansa (and Luftwaffe), still possess an intact plant in their Finkenwerder works; while "Weser," who made large quantities of Dornier and Heinkel aircraft as well as Focke-Wulf fighters and Junkers bombers, have factories, at Lemwerder and Eiswarden in Oldenburg. The former chairman of the aviation company, Fritz Feilcke, believes that these were deliberately spared by the Americans to be used by them later as ordnance depots. Together they possess a useful floor area of over a million square feet, intact heating, water, and electrical installations, and a land and sea runway. Moreover, new machine tools can be obtained from the parent company, of which Alfried Krupp is the main shareholder.

For immediate purposes the aviation branch of Henschel—which produced the Hs126 army co-operation aircraft, the armoured Hs129 ground attack aircraft, and the Hs293 guided missile—is not so well off, for its aircraft production centres were both in Berlin. Facilities, I am told, will have to be found among the parent company's existing three plants in and around Kassel. Apart from its share in the official programme, the Henschel company signed a contract some months ago for the licensed production of Sikorsky 55 and 58 helicopters (which, incidentally, may have infringed Westland's European rights in these machines). In this connection, the recent engagement of Prof. Heinrich Focke, of pre-war helicopter fame, looks significant. It may mean that there are plans to build in Germany the Professor's reversible (vertical-horizontal) engined aircraft which is being developed in Brazil from war-time blueprints.

In charge of aviation developments at Henschel is Karl Frydag, former technical director of the aviation company, who during the war was put in charge of Heinkel gas-turbine developments by the German air ministry. Both he and Fritz Feilcke of "Weser" are members of the advisory committee of the industry's Association.

The fourth member of this group, the Siebel Werke, is not in the north at all, but at Munich. Its membership is chiefly due to the fact that the French organization S.N.C.A.N., from which the licence to manufacture the Noratlas 2501 transport was obtained, previously constructed the Siebel 204 during and after the war. Incidentally, the Siebel Werke hope soon to start production of a modern version of the pre-war Siebel "Bumble Bee," to sell for about £1,700.

Three famous names in German industry before, during, and since the war: (left to right) Professors Willi Messerschmitt, Claudius Dornier and Ernst Heinkel.

Four more personalities: Karl Schwärzler, technical director of Heinkel A.G. and chief designer since 1922; Arthur Rothe, director of Focke-Wulf; Hans Hornung of Messerschmitt, who designed the post-war Me100 and Me200 in Spain; and a political supporter of the aviation industry, State Secretary Professor Leo Brandt of North Rhine-Westphalia.

GERMANY'S AVIATION INDUSTRY . . .

As for the Noratlas, the present programme is that the fuselage will be made by Blohm und Voss, the mid-wing by "Weser," the wing-tips by Henschel, and the tailplane and engine nacelles by Siebel—the components from the other firms to be shipped to Hamburg for assembly by Blohm und Voss, where the best runway is said to be available.

Group II.—This is also a northern group, consisting simply of Focke-Wulf G.m.b.H., Bremen, and the engineering office at Duisburg of Professor Blume, late chairman of Arado, and designer of the most promising jet aircraft of the war, the Ar234 four-engined reconnaissance bomber, which was able to photograph Britain unmolested. It was he who recently obtained the licence for the production by Focke-Wulf of the Piaggio 149 primary trainer—work which has not yet started.

Though Prof. Tank, former chief designer of Focke-Wulf, recently returned to Germany from the Argentine, there is no immediate indication of his rejoining his old firm, which at present consists of a humble administrative building on the edge of Bremen airport and a waste of blasted workshops, only one of which has so far been recommissioned. The floor space of this building occupies 12,000 square metres (129,600 sq ft), and its present production consists of Kranich III and Weihe gliders, light metal products for the shipbuilding industry, appliances and tools for the automobile industry, and hydraulic apparatus for industrial workshops—all of which, it was stressed, are readily switchable to aircraft production. I also saw under construction the prototype fuselage of the first all-German, all-metal post-war aircraft, the Blume 500—a four-seater, single-engine job which will no doubt meet the needs of the German Aero Club more cheaply than imported aircraft.

Though Focke-Wulf at present have a nucleus of only 200 trained workers, some 10,000 former employees are still in Bremen, currently employed in the automobile (Borgward) and shipbuilding ("Weser") industries. The present director, Arthur Rothe (no relation to the chairman of the Association) is also optimistic about the resurrection of at least some of the neighbouring workshops, whose steel structures are intact. So, relatively speaking, is the financial structure, inasmuch as 25 per cent of the firm's capital is owned by Café Hag, Bremen (coffee importers), and a further 25 per cent by the firm of Lorenz, Stuttgart, makers of radio amplifiers, teleprinters, telephone apparatus, etc., which in turn is owned by the International Telephone and Telegraph Corporation of the U.S.A., and from which firm Herr Rothe moved over three years ago.

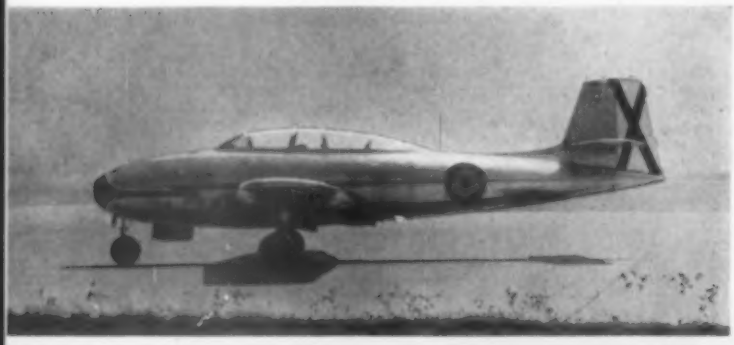
Though it looks as if it will be some time before Focke-Wulf can begin the series production of any aircraft, the association with Prof. Blume and his designing team should provide plenty of future scope. According to reports the Professor already has a twin-engined turboprop civil aircraft on the drawing board, for initial production probably by Piaggio in Italy. The Bremen runway, moreover, is 2,000 metres (2,190 yd) long.

The Southern Groups.—With the East gone, there are practically no aviation firms between the extreme north and the extreme south, and none at all in that otherwise highly industrial province, North Rhine-Westphalia. (The plan largely sponsored by Leo Brandt to utilize the waste factory area of Krupps in Essen seems to have been discarded.)

Group III therefore comprises the firms of Ernst Heinkel A.G. and Messerschmitt A.G., whose first official commitment for the Luftwaffe is expected to be the construction of the French Fouga C.M. 170R Magister jet trainer, for which Prof. Messerschmitt has obtained the licence.

The present Heinkel factory at Stuttgart-Zuffenhausen is all that is now left of his former empire that stretched from Rostock, the headquarters on the Baltic, to Vienna and the Tyrol. It was bought in 1941, at the instance of the German air ministry, from the Hirth Motorenwerke for the purpose of developing Heinkel turbojets like the He S.11 and S.30. These never reached the operational stage during the war, though six of the former were built afterwards for experimental use by the U.S. Navy.

The factory is quite unsuitable for airframe production, and Heinkel only got it back in 1950. Since then the production has consisted of Mopet light motor cycles (to ride which in Germany no licence is required!), plus engines, some two-stroke, with two, three or four cylinders, for delivery vans and cars. A further works at Karlsruhe was acquired in 1954 for the production of the Heinkel Tourist scooter, and, recently, a third works has been added, at Speyer. Provisionally the last is allocated to the production of the new Heinkel cabin scooter, due to appear this year; but this is also where aircraft production is planned. The ground is flat, a runway will be available, and no doubt the presses used for scooter bodies can be adapted to airframes. Few of the present 1,400 employees will go to Speyer, but advertisements in the German aviation Press for aircraft technicians imply that a recruiting drive is afoot.



Two views of the Me200 designed by the Messerschmitt team working in Spain. The aircraft is a jet trainer powered by two Turboméca Marboré 2 engines. Something of the characteristic Messerschmitt stamp is apparent in the side view.

Prof. Heinkel, now 67, was elk shooting in Sweden at the time of my visit. He has two sons in the firm, and the designing team includes several men like Karl Schwärzler, technical director and chief designer, who have been with the firm since its foundation in 1922. Dr. Trückenbrodt is in charge of aerodynamics, and Heinkel also has the services of a top-notch airframe designer.

Present head office of Messerschmitt A.G. is at Tozerstrasse 40, Munich, in the premises of the Aeso Screw Factory, a dependent company. Since 1926 the main works have been at Augsburg, where the firm took over the former Bayerische Flugzeugwerke (the first Me109s were called Bf109s). These works were 60 per cent destroyed by bombing, and the surviving workshops are at present devoted to the production of sewing machines and Vespa scooters, under licence from Italy. There are, however, some only partly damaged workshops, at present empty, which form a reserve for aircraft production. In expectation of future aviation contracts a new site, under the name of Messerschmitt Rheinland G.m.b.H., was recently purchased in Essen, though I understand this will have to be built up from scratch. The other works at Regensburg is likely to continue producing the Messerschmitt 175 cabin scooter, a number of which have already been sold in this country. The firm also owns a subsidiary company which makes furniture and radio amplifiers.

The present employment roll of 1,800 (formerly 20,000) includes a nucleus of former aviation technicians; and, as at Heinkel, several men of the designing team, like Wolfgang Degel and Hans Hornung, are foundation members. Prof. Thalau, known for his book on aircraft statics, has recently been recruited as technical director.

Prof. Willi Messerschmitt was said to be very active (he founded the firm at the age of 25, and is now only 57), often keeping his designers working till late in the evening and concerning himself personally with details of construction. At the time of my visit he was in Spain, with which country his association is long-standing, a licence to build the Me109 having been obtained by the Hispano-Aviación company before the war (the firm is still making them, though now with Rolls-Royce Merlin engines!). In 1952 he took a group of designers, headed by Hornung, to Madrid. There, in association with the Spanish firm, the Me100 and 200 (in Spain known as the Ha100 and 200) have since been developed for the Spanish air force. The aircraft are basically similar in design, though the first is a single-engined primary trainer, the second (which first flew last August) a jet trainer powered by two Turboméca Marboré 2 engines.

Reports that Messerschmitt is planning a delta-wing jet fighter for the same market were denied by two of his designers. It may be noted that the chief designer of the Me163 delta-wing rocket fighter, Dr. Lippisch, is working in America, though test pilot Heini Dittmar—who was the first to reach 1,000 km/hr in this machine—is now in Germany and responsible for one of several prototypes of light aircraft that have recently flown. [His ultra-light Motor-Möve was described in *Flight* for November 11th, 1955.]

The remaining "group" consists solely of the Dornier Werke G.m.b.H., though in theory work could be farmed out to other members of the Aero Union, of which Prof. Dornier is president and his director, Hans Fieser, manager.

The main Dornier works at Friedrichshafen on Lake Constance—the former Zeppelin works where Prof. Dornier first became employed in 1910—were badly damaged during the war; and, though they remain the headquarters and research centre of the firm, nothing is at present being produced there. Main activity is at the Munich-Neuaubing works, where 150 men are engaged in the production of a variety of light metal products, under the technical direction of Claudius Dornier junior and Fieser. The firm is, of course, famous, apart from its bombers, for flying-boats, and research in this field and in helicopters (they seem very popular in German planning) is believed to have been going on for the last five years. Herr Fieser told me helicopters could probably be assembled and flight-tested at the Neuaubing factory, but for the assembly and tests of conventional aircraft it was planned to use the Dornier works at Oberpfaffenhofen. These are at present idle, but have a runway (the prototype of the Do27 was based there when it was recently brought over from Spain). A fourth works at Lindau, under the management of the Professor's second son, is expected to continue making textile machinery for the present. A number of the firm's former designers and technicians are said recently to have returned.

Another German prototype built in Spain is the Dornier Do27, at present powered with a 270 h.p. Lycoming. The German Defence Ministry has shown interest in it as a communications and observation aircraft for the Services.

Prof. Dornier's association with Spain, dating back 25 years, led him in 1950 to found there the firm of Oficinas Technicas Dornier, which (in 1954 and 1955 respectively) produced with Spanish aid the all-metal Do25 and its successor the Do27—in the design of which the Professor himself is said to have taken the leading part. The latter, a five-seater general-purpose aeroplane of conventional high-wing design, has been compared to the old Fieseler Storch in flying qualities. With its present Lycoming 270 h.p. engine it has a minimum speed of 36 m.p.h., a cruising speed of 145, and a maximum of 160. It can land from 50ft in 100 yd, and from the ground can rise to the same height in 170 yd.

The prototype of the Do27 was flown in Germany last October before representatives of the German Defence Ministry, as a result of which it was provisionally chosen as a communications and observation aircraft for the Services—the first post-war German aircraft to have this distinction. When I saw him, Herr Fieser expected serial production to begin early this year.

(To be continued)

THE AIR AND THE LAW

FOR many years *Shawcross and Beaumont* has been the standard British text-book on aviation law, and has been produced as an authoritative reference in proceedings varying from the Comet Inquiry to a case of alleged low flying of an Auster causing a horse to throw its rider. The second edition, published in 1950, has certainly proved to be the single-volume "text-book and compendious tome of reference" which the authors aimed to produce at that time.

The main text of this edition consists of twelve sections, the first giving a brief historical summary and the remainder dealing in turn with the nature, sources and scope of international air law; of English air law; administration of English law relating to aviation and air transport services; laws restricting and regulating the right to fly; laws governing the establishment and operation of air transport services; carriage by air; surface damage, collisions and other incidents of liability from the operation of aircraft; ownership, possession, hire, manufacture and other commercial dealings in aircraft; law of master and servant in connection with the use and operation of aircraft; airports, aerodromes and air navigation facilities; and aircraft and aviation insurance. It is supported by appendices in which are set out verbatim all relevant statutes, treaties, orders and regulations; and by tables of statutes, of cases, and of statutory rules, orders and instruments. Text and appendices take up 1,238 pages, the index alone accounting for a further 139.

The law stated in the second edition was that in force at July 31st, 1950, and the intention of the second cumulative supplement* is to bring the book up-to-date to October 31st, 1955. A full list of notations to text and appendices is given, together with tables of statutes, cases (mainly American and Canadian) and statutory rules, orders and instruments.

Among the main international developments referred to are the 1955 protocol to the Warsaw convention; the final act of the Hague conference on private air law; the Rome convention of 1952 (the only new convention concluded) and the two 1954 protocols to the Chicago convention. British domestic legislation includes the Carriage by Air (Non-international Carriage) (United Kingdom) Order of 1952, the Air Navigation Order, 1954, the Air Navigation (General) Regulations, 1954, and the Air Navigation (Radio) Regulations, 1954; the Air Corporations Act, 1953, and the Civil Aviation (Investigation of Accidents) Regulations, 1951, made under Section 10 of the Civil Aviation Act, 1949. British colonial legislation during the period 1950 to 1955 is also described.

*"*Shawcross and Beaumont on Air Law. Second Cumulative Supplement to Second Edition," by C. N. Shawcross and K. M. Beaumont, assisted by R. S. Kinsey and D. Knight. Butterworth and Co. (Publishers), Ltd. Price (supplement alone), £2 2s; combined price, £7 7s.*

Shown in its original Aerovias Guest colours, this Constellation 749 was the first of its type produced. After only four months' service with the Mexican airline it was traded back to Lockheed for re-sale to Air France; now, however, Aerovias Guest have acquired two ex-Qantas Constellations of similar type.

A CONSTELLATION SAGA

LOCKHEED'S graceful "Connie" holds a special place in the hearts of such aircraft historians as Dennis Powell, who has unearthed the following impressive facts about the fleet of six Constellation 749s formerly operated by Qantas Empire Airways. He also provided the accompanying photograph, a "collector's piece" which, Mr. Powell believes, has never previously been published.

WITH the departure of Constellation VH-EAD, operating Qantas flight EM602 from Johannesburg on October 20th, 1955, culminated the remarkably fine record of almost exactly seven years of highly successful L.749 operations by Qantas. Of the original Q.E.A. fleet of six 749s, four were sold to B.O.A.C. in mid-1954—VH-EAA, 'AB, 'AE and 'AF (which are now flying as G-ANTF, 'TG, and G-ANUP, 'UR on the famous "Kangaroo" route).

The two remaining Connies—VH-EAC and VH-EAD—were recently sold to Aerovias Guest S.A. of Mexico, who will operate them between Mexico City and Windsor (Ontario) *via* Detroit following permission granted by the Canadian Government to open this new route between Canada and Mexico.

Originally named *Ross Smith* and now R.M.A. *Berkeley*, VH-EAA was delivered to Qantas at Sydney on October 14th, 1947, having been ferried 7,800 miles from California by a joint Qantas-Lockheed crew in 42½ hr elapsed time. This was the aircraft which operated the first Sydney-London Constellation service on October 22nd, 1947; three more aircraft, newly purchased from Lockheed, were all delivered to Qantas in the same month and were placed on the "Kangaroo" route shortly afterwards.

The remaining two Connies—VH-EAF and VH-EAE—were later purchased from Air-India International: these two aircraft, previously registered VT-CQP and VT-CQS, were actually the second and third 749s off the production line, constructors' serial numbers being 2504 and 2505 respectively.

During the whole of their service with Qantas these six transports logged a grand total of 106,659 hours, made up as follows:—

Route	Flying hours	
Sydney - London	89,782	
Sydney - Johannesburg	6,004	(since Jan. 1950)
Sydney - Tokyo	1,579	(since Jan. 1954)
Charter and test flying, etc.	9,294	
	106,659	

Thus, each of these six Connies in Qantas service logged an average of 2,538 hours per annum for seven years—a comparatively high figure considering the "involved" types of long distance routes and schedules on which they were operated.

With Qantas, these six Connies have flown the huge total of approximately thirty million miles without a single fatal accident of any kind, adding another chapter in the proud history of Australia's great overseas airline. The original decision to purchase the type (early in 1947), was due chiefly to the foresight of the airline's founder and its then managing director—Sir Hudson Fysh.

It seems that these six 749s still have many more years of reliable and efficient airline service ahead of them. Good luck therefore to B.O.A.C. and Aerovias Guest, both of whom, one feels sure, will continue to operate them as successfully as their original owners. In conclusion, it may be noted that Qantas sold these six Constellations (with spares) for some £4,300,000, which was just about the original market price paid for them seven years ago.

The accompanying photograph of Aerovias Guest Connie XA-GOQ is perhaps of special significance, in view of the news of the sale of two Qantas 749s to this Mexican airline. As long ago as July 1948 it was purchased by Aerovias Guest for the purpose of operating regular services between Mexico and Spain. Negotiations for the operation of this service proved unsuccessful; after being in service for only four months with Aerovias Guest (on their Mexico City to Miami routes) it was "traded back" to Lockheed, who later sold it to Air France. It is still flying with the French airline as F-BAZR. This particular Connie (constructor's serial number 2503) was the first Series 749 built. It would be interesting to know the number of hours it has logged with Air France.

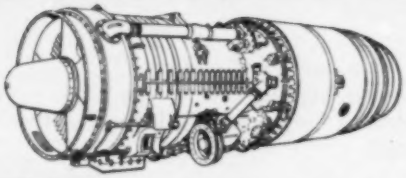
PLASTICS TECHNOLOGY

BASED on papers read at last year's British Plastics Convention, a newly published book* brings together a number of the more important new developments in plastics technology. The work is divided into nine sections under the following headings: Polymer structure and properties; Expanded plastics; Thermoplastics; Extrusion; Work study and productivity; Injection moulding; Patents; Foundry resins; and Glass-reinforced plastics.

Many of the papers given at the Convention were based on original investigations and for these the book provides first publication. For example, the long paper on *Fundamental Problems of Single-screw Thermoplastic Extruders* contains much new data, as do the papers on *The Effect of Injection-moulding Variables on the Quality of Mouldings* and *Recent Advances in Injection Moulding Techniques* and on the *Evaluation of Moulding Materials*.

*"*Plastics Progress 1955: Papers and Discussions at the British Plastics Convention 1955." Edited by Phillip Morgan, M.A., editor of "British Plastics." Published for "British Plastics" by Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Illustrated. Price 50s.*

THE *FAIREY* DELTA 2



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AIRCRAFT INTELLIGENCE

U.S.A.

Lockheed F-104. It is believed that this intercepter is armed with a new type of so-called "Gatling" gun—a multi-barrel weapon, thought to be power-operated and to have a fantastically high rate of fire. At least one version of the F-104 may also have ramjets mounted at the wing-tips.

Republic F-105. Described as a twin-jet fighter/bomber, powered by two Allison J71 turbojets, the first Republic F-105 has been extensively damaged in a crash landing at Edwards Air Force Base, California. The starboard main undercarriage lock failed in flight, and the assembly, having dropped into the lowered position, was torn off in a high-speed turn. A second prototype has been at Edwards A.F.B. since last December.

Italy

Bernardi Aeroscooter. This tiny ultra-light, developed by Mario de Bernardi, of Schneider Trophy fame, is now flying in single-seat and two-seat forms. Eventually the two-seater will have a small rotor to enable emergency landings to be made in greater safety and—with the assistance of a bottle of compressed air—to permit vertical take-off. The machine is a low-wing monoplane with fixed nosewheel undercarriage and a boom-type fuselage.

France

S.E.210 Caravelle. An American tour, taking in Washington, Philadelphia and possibly New York, is planned for this twin-Avon airliner. New York is still a doubtful point of call, in view of the fact that both the Comet and Boeing 707 have been barred on the ground of excessive noise. Republic Aviation have expressed interest in the acquisition of a constructional licence for the Caravelle.

S.O.4050 Vautour. Most of the pre-production Vautours have now been delivered to the French Air Force for test under operational conditions at military bases. The 04 is continuing intensive trials and has already logged its 150th hour in the air.

S.E. Baroudeur. At the time of last year's International Air Show at Le Bourget development of the two prototype Baroudeurs was practically complete. With a few minor modifications the machines were handed over to military pilots, who are said to have reported favourably, particularly in respect of rate of climb and high-altitude manœuvrability. Two of three pre-production Baroudeurs, designated S.E.5003 and powered by S.N.E.C.M.A. Atar 101D3 turbojets of 6,400 lb thrust, are now complete, and it appears to have been one of these machines which recently proved to be perfectly controllable at near-sonic speeds without the use of control boost. The two existing pre-production machines will now be subjected to tests from different types of terrain, including snowbound fields, and the third will probably be fitted with a turbojet of higher thrust.

Dassault M.D.550. It was recently disclosed that "constructor's" development of this delta-wing light intercepter occupied only six months—a remarkably short period by modern standards.

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The first badge.

No. 18 SQUADRON

A Bomber Command Unit with a Remarkable History PART I

The present badge.

By JOHN YOXALL

DETAILS of the early history of No. 18 Squadron are sparse, as is not uncommon with units formed during the early part of the 1914-18 war. Those squadrons formed before the war or after the critical period had passed were duly documented, but some which came into being in the first half of 1915 seem to have been neglected in this respect.

Fortunately, No. 18 Squadron's original commanding officer, G/C. G. I. Carmichael, is still with us; and, following a request made at a squadron guest night held last year, he has been kind enough to furnish from memory an account of the birth of the unit and its first year of active service.

No. 18 Squadron, Royal Flying Corps [he writes], was formed from No. 4 Reserve Squadron at Northolt on May 11th, 1915. Conditions were primitive—one hangar completed, one hangar being built and the landing ground consisting of two fields separated by a transverse ditch, partly bridged by planks. Aircraft available were some Maurice Farman Longhorns (70 h.p. Renault), which were pusher machines with elevators in front, one 50 h.p. Avro (Gnome) and one single-seater Martinsyde scout (80 h.p. Gnome) for Zeppelin-hunting.

In August 1915 the unit moved to Mousehold Heath, Norwich, where it was built up to establishment and equipped with Vickers Fighters (100 h.p. Gnome Monosoupape rotary engine), the first of which arrived on October 6th. Mobilization began on November 1st and the ground party embarked on November 10th; aircraft, motor transport and personnel were reunited at St. Omer on the 19th. Thus, in just over six months, the squadron was formed, trained, mobilized, and operating overseas as a fighter/reconnaissance unit.

Flights were so organized that they could be detached and function independently, undertaking minor repairs to aircraft, cooking their own meals and even barbering. The whole squadron, including its H.Q. workshops (which could do, and did, major overhauls) was extremely mobile and able to pack up and change aerodromes overnight. It moved seven times during the first year, sometimes at very short notice.

At the time of going abroad the majority of pilots had done less than 20 hours' solo and the observers had negligible air experience. Personnel soon settled down and, though there were some flying accidents, these were attributable less to inexperience than to the Monosoupape engine. This engine, which later became so deservedly popular in the Avro for flying training, suffered at that time from infantile precocity and could splutter to silence when taking off or shed anything from rocker arms to complete cylinders in flight.

Fighting reconnaissance [continues G/C. Carmichael] would have been a more ideal rôle for the squadron if the Vickers had been faster, for its 180 deg forward view was perfect. Its slow speed, however, invited attack from below and behind, where it was blind. Replacement came in April 1915 by the reliable F.E.2B, another pusher machine. With the change of aircraft came also a change of rôle to that of Army Co-operation in the line opposite Vimy Ridge, operating from Bruay with IV Corps.

The F.E.2.B was excellent for artillery observation, Tac. R and photography. Considering the small landing ground and lack of navigation facilities, night-flying training started with remarkable success. During this period, only one pilot really lost his way at night; having exhausted petrol, Very lights, Klaxon horn, and an illuminating flow of Canadian expletives, he landed perfectly in complete darkness behind the French lines, some 60 miles south.

In September 1916 the squadron moved down to Lavieville for the Somme battle, and was allotted to the Cavalry Corps, which was to exploit any break-through. Tactical co-operation was practised with each of the Brigades in turn. Air-to-ground intercommunication was by dropped message-bag; ground-to-air was by morse code or by ground strips, or by message-bags strung between two poles and picked up by a grapnel lowered from the aircraft. A very close liaison was built up, but the break-through was not achieved, though No. 18 Sqn. did support the one attempt by low-flying attack and contact patrol.

Low flying on the Somme demanded a high standard of aerial *dressage*, as the front was festooned with observation balloons whose position in the air appeared to have little relation to their ground-winches or the connecting cables. However, only one cable was struck by No. 18 Sqn.; the offending F.E.2B flat-spun safely to earth but the balloon disappeared over Germany.

It was from the squadron's attachment to the Cavalry Corps on the Somme in 1916 that the unit's Pegasus badge originated.

Simultaneously with the preparations for break-through during the Somme battle, No. 18 held one flight on duty each night for retaliation bombing of active German aerodromes. These were difficult to find, as the Germans used only small red lights. During the night of November 10th and 11th, 1916, every machine of the squadron carried out reprisal raids for the bombing of Amiens.

This nocturnal activity soon developed into No. 18 Sqn. *v.* The Rest. A dummy flarepath at first received punishment, but enemy aircraft eventually learned the squadron's technique by following homing machines. They waited for one to land, or themselves caused the aerodrome flarepath to be lit by firing the night's recognition signal; and then dropped bombs. Although sticks of small bombs straddled the aerodrome and the camp, there were no casualties.

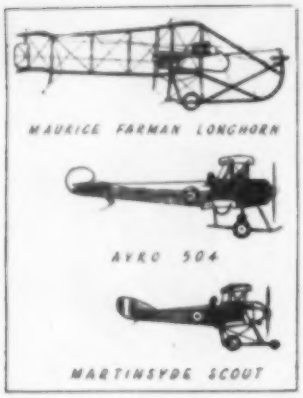
In the late autumn all chance of a cavalry break-through over the seas of mud, water and shell craters ended, and in December 1916 the squadron moved to St. Leger for army recce. and night-bombing, and Maj. R. S. Maxwell took over command. Here the stay was of short duration as, although a comfortable winter camp had been prepared, it was within range of enemy guns. On January 22nd, 1917, when shells began to fall among the canvas Bessonneau hangars, No. 18 once again lived up to its reputation for mobility and moved to Bertangles.

It was during the Somme Battle that the Lewis gun double drum and the deflection fore-sight came into production. Both were inventions of Capt. Norman, an early pilot and flight commander of the squadron, who made the prototypes in the squadron work-shops.

Without parachutes, crippled or burning aircraft could not be abandoned, and wounded crew could seek salvation only by landing. Some remarkable cases of courage, resolution, and teamwork between pilot and observer occurred in air combat,

Major G. I. Carmichael, the first commanding officer of No. 18 Squadron.

No. 18's equipment today—English Electric Canberra B.2s. This photograph was taken, at 30,000ft and Mach 0.78, by the author.



NO. 18 SQUADRON . . .

No. 18's original aircraft and (above) equipment from 1915 to 1939.

contact patrol, and night bombing. On February 21st, 1916, for instance, Lt. M. Henderson, with Lt. C. J. Scholte as observer, was at 6,000ft on reconnaissance when an anti-aircraft shell passed through the nacelle, taking off his leg. He asked his observer to guide him back over the lines and landed behind a French battery. It was not until he asked his observer to release his belt that the latter realized he was seriously wounded. Before the end of the year Lt. Henderson, equipped with a wooden leg, was flying single seater fighters again.

In March, 1916, Lt. G. H. Hall and his observer had a forced landing and overturned. An officer appeared from nowhere and was peremptorily ordered to "be quick and do something"; and in a remarkably short space of time troops arrived with rope, released the crew and turned the machine right way up. The officer was the Prince of Wales (later King Edward VIII and now the Duke of Windsor).

During September of the same year, while on contact patrol as observer to Capt. J. C. Callaghan, Cpl. B. Ankers climbed out of the cockpit and down to the undercarriage to release a grapnel message which had caught up. On another occasion an observer, Lt. B. F. Randall, took over the controls and landed the F.E. after his pilot had been wounded and was unconscious.

To deal with an attack from the rear, the observer in an F.E.2B had to stand up in the cockpit and fire over the top of the upper plane. On one such occasion Lt. F. S. Rankin was hit and slumped over the side of the cockpit. He would have fallen out of the aircraft if the pilot, Lt. F. L. Barnard, leaving his own seat and the controls, had not pulled him in. In the years following the first war, F. L. Barnard won the King's Cup race twice; eventually he lost his life while testing the Bristol Badminton for the race in 1927.

So ends the account provided by G/C. Carmichael. It may be added that he was one of the first officers to be seconded to the Royal Flying Corps. As early as 1913, he and Lt. Cholmondeley flew to Colchester to give passenger flights to officers of the garrison there, in the hope of getting converts. As a flight commander in No. 5 Sqn. he was a member of the original R.F.C. contingent of the British Expeditionary Force.

Starting from Gosport to fly to France, he wrecked his aircraft; but he obtained a B.E.8—known as the "Bloater"—and caught up with his unit on time.

As stated above, Maj. Carmichael handed over command of the squadron to Maj. R. S. Maxwell; but the latter held the appointment for only three months before it passed to Maj. G. R. M. Reid. A. V-M. Sir Ranald Reid, as he now is, has also recalled for us some memories of No. 18 Squadron in 1916 and 1917.

"I took over No. 18 Squadron from George Maxwell in France in March 1917," he says. "Spring was in the air and even the F.E.s felt this. The good rugged old F.E.s were doing fine work —distant reconnaissance, bombing with 25lb bombs and fighting. But the F.E. had been long overseas and was becoming outclassed by new enemy fighters and had a hard time fighting back against them on the return journeys and also against the prevailing wind.

"The machine being a pusher, the observer had to stand up above the pilot and fire to the rear with the 'weeping willow' gun mounting—a very unsatisfactory means of defence, to say the least of it. Naval 3 Squadron on Sopwith Pups, and Naval 8 on triplanes, were a godsend as escorts."

And here Sir Ranald adds an interesting postscript to G/C. Carmichael's account of Barnard's experience. "I well remember," he says, "that almost the first form I had to send in as C.O. asked whether the wound which had taken a pilot to hospital was 'self-inflicted.' He had torn arm muscles, through holding his wounded observer who had fallen over the side of the F.E., and flying him all the way home thus. On landing, it was found that the observer was dead. Self-inflicted! This pilot should have been decorated, but the incident had happened some time before and the recommendation was too late."

A.V-M. Sir Ranald Reid continues: "Vesey Holt was our very live wing commander, and many were the plots hatched at squadron commanders' conferences (followed by an excellent dinner at Wing H.Q.) with the three squadron commanders, Mulock, Tommy Cairns and myself. One scheme, to land and burn all the German aircraft on Carnieres aerodrome was fully worked out, even to the white suit an observer was to wear while the landed F.E.s covered his activities with machine-gun fire. But our casualties at the time became too heavy and Brigadier-General C. A. H. Longcroft had to cancel the operation. Three F.E.s were shot down in flames at about the time of this decision. Fortunately two were flaming only in the gravity tank and got safely home.

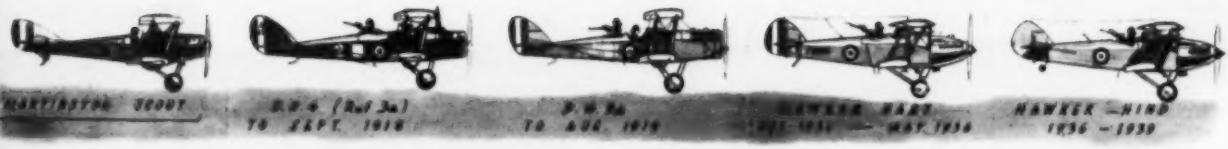
"Charles E. Bryant was a tower of strength as the senior flight commander. He had won a very early D.S.O. leading a cavalry charge. Aged 33 years he was regarded by all of us as a very gallant Methuselah; he won another D.S.O. in the air.

"At last a replacement type of aircraft arrived. Everyone had been indulging in the new vogue of spinning F.E.s for fun (quite a difficult feat), but this did not pay on the new D.H.4s, the first of which promptly lost its tail in the air after a spin; and the R.A.F. IIIA engine was appalling. In the hurry to get this replacement overseas some 57 modifications had not been incorporated and all these bugs came out in service. Poor Brooke-Popham, from R.F.C. H.Q., was often with us trying to help out. He was always met with some new engine horror—valves pounded into balls in the cylinders and shot out of some part of the brute's anatomy. It was a good aircraft otherwise, and later it did great work.

"I left No. 18 at the end of November 1917 with very happy memories of a very fine squadron," concludes Sir Ranald. "The

The vane sight and double ammunition drum of the Lewis gun were invented by Capt. Norman of No. 18 Squadron.

(Below, left) A not unfamiliar happening to aircraft in the 1914-18 war: an F.E.2B of No. 18 Squadron after a landing in November 1916. Sometimes the results were more serious, as seen below; this photograph was taken by A.V-M. Sir Ranald Reid, who was the unit's third C.O.



aircrews and airmen were as good as any I have known."

The work of the squadron in the field was exemplified during May 1916, when the Germans made a heavy attack on Vimy Ridge. The battle opened on the afternoon of the 21st. The attack was borne by IV Corps, and No. 18 Sqn. aided the ground troops by spotting for the artillery. Next day the squadron started flying at 0400 hr; but when the real weight of the German bombardment was felt in the late afternoon the number of aircraft engaged was doubled and Nos. 25 and 10 Sqns. were called in to help. Haze was troublesome, but all observers located active German guns.

Poor visibility the next day made reconnaissance difficult but during the early hours of darkness on May 24th two aircraft from the squadron made flights over the Lens area to watch for unusual rail or road movements. The second aircraft had its tail damaged by anti-aircraft fire.

As mentioned briefly by G/C. Carmichael, No. 18 joined the Battle of the Somme in July 1916. It was during the third phase, which opened on September 15th, that for the first time, tanks were present to drive a gap through the enemy front. The scheme provided for cavalry exploitation of any break-through and No. 18 Sqn. was specially trained to co-operate with the cavalry in any such manœuvre.

Although no major break-through materialized the unit took part in some terrific fighting. On the morning of the 16th one of the squadron F.E.s fouled the cable of No. 6 Section kite balloon. It did not get away with it as easily as did the one referred to by G/C. Carmichael. The balloon observer's parachute failed to open and he was killed; the F.E. crashed, the pilot being injured and the observer killed.

It was during the Battle of the Somme that the incident occurred in which Lt. Randall, an observer, took over control after his pilot had been wounded. The official report of the incident says:—

"The pilot, 2nd Lt. F. Hall, of the aeroplane of No. 18 Squadron which was hit by a shell, became unconscious in the air. The F.E.2B was then attacked by a Roland but fell into a spin. It came out of the spin and the observer, Lt. B. Fitz H. Randall, took control and brought the aeroplane into our lines where, on landing, it ran into a shell hole and overturned. The observer dragged his pilot from the aeroplane and, assisted by the infantry who rushed to help, carried him towards a dressing-station, but he died on the way."

Heavy rain came in October and mud made the long-hoped-for break-through an impossibility. Released from their cavalry support rôle, No. 18 reverted to bombing and Army co-operation. Much of the bombing was done at night against targets offered by enemy transport—a form of attack they were to repeat in North Africa and Italy 27 years later.

Towards the end of the war the D.H.4s were exchanged for D.H.9As with 400 h.p. Liberty engines, and with these new aircraft the squadron operated until the armistice. After that it was engaged in flying a mail service between Lympne and Cologne. It was disbanded at Weston-on-the-Green on December 31st, 1919.

No. 18 Squadron's second span of life began on October 20th, 1931, at Upper Heyford—where, curiously enough, the station commander was G/C. G. I. Carmichael, the original C.O. of the unit.

In command was S/L. T. C. Luke, M.C., who on November 6th collected the squadron's first Hart (J9946) from No. 33 Squadron, which was the first squadron to be equipped with this then very advanced type. J9946 was fitted with dual control. Squadron formations were being flown by the following April and in June No. 18 led the wing drill event at the R.A.F. Display at Hendon.

After commanding No. 18 for a year S/L. Luke was unfortunate enough to be involved in a road accident while the squadron was in armament camp at North Coates Fitties. Command passed to S/L. J. F. Gordon, D.F.C., who had disbanded the squadron at Weston-on-the-Green 13 years earlier, but Luke was able to resume control a month later.

There was the usual round of peace time activities—practice for the Display, armament camp, practice mobilization and the unit's annual leave period which lasted a month. Other, more unusual, jobs came up occasionally. In February 1934 the squadron flew to Evère, Belgium, to escort the Prince of Wales to the funeral of the King of Belgium. In the following April they gave exhibitions of dive bombing before the Imperial Defence College and later, at Northolt, before the officers of H.M.S. *Excellent*. During the latter demonstration Sgt. Light and his air gunner, L.A/C. Dowsing, were both killed.

At the end of June 1935 the squadron once more participated in the wing-drill event at the Display (this time the formation was led by S/L. G. S. Shaw, who had taken over command the previous March) and in July No. 18 took part in the Royal Review by King George V at Mildenhall.

Bearing in mind the ancestry of the London Airport site, it is interesting to note an entry in the squadron diary for September 1935, to the effect that the unit "proceeded to Heathrow for army manœuvres."

By 1936 the expansion of the R.A.F. was under way and "C" Flight, equipped with Hawker Hinds which they had collected from Brooklands, became the nucleus of No. 49 (Bomber) Squadron. Later the whole of No. 18 received Hinds. As a Canberra squadron today, the unit regards heights of 45,000ft commonplace; but even in 1936—with open cockpits—practice raids were made by Hinds at 25,000ft, and at that altitude were intercepted by Gloster Gauntlets.

In 1936 the squadron badge was presented by Air Chief Marshal Sir John Steele. It is one of the very few approved and signed by King Edward the Eighth.

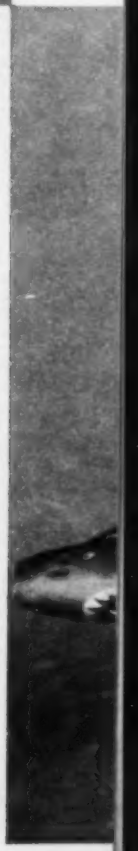
For the period from the end of 1936 until the outbreak of the Second World War there is a gap in No. 18's records. It is next related that on September 3rd, 1939, general mobilization found the squadron—with 21 Bristol Blenheims (short-nosed) and an establishment of 17 officers and 366 men—serving as part of No. 6 Group. They were still stationed at Upper Heyford, with Brackley as a satellite airfield.

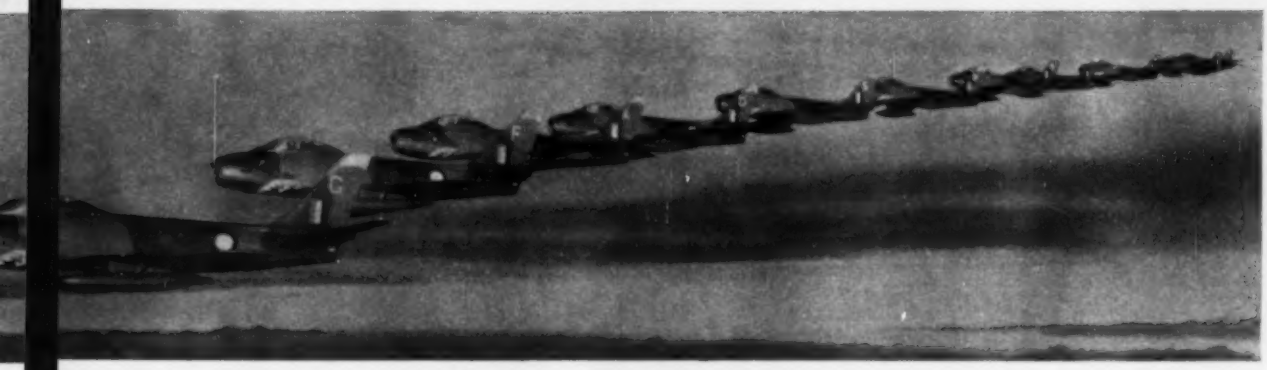
(To be continued)

(Above) No. 18 Squadron D.H.4s in 1917. (Right) Capt. F. L. Barnard, who held his wounded observer while he brought his F.E.2B back to base. He is seen with the Bristol Badminton in which he was killed whilst practising for the 1927 King's Cup Race.

THE SHARKS' TEETH INSIGNIA ARE SEEN AGAIN

WHEN the 2nd Tactical Air Force in Germany decided to adopt distinctive markings for fighter squadrons, similar to those used by home-defence fighter units since the early 1920s, one squadron made a special request, for traditional reasons, to be allowed to restore its unorthodox war-time marking. The Air Ministry rule is that fighter squadron markings shall conform broadly to geometrical patterns—squares, triangles, rectangles, etc.—but No. 112 Squadron, stationed at Bruggen, wished to decorate its Sabres with the sharks'-teeth motif with which its Tomahawks and Kittyhawks were bedecked in the Western Desert during World War II. Approval was received and the squadron's Sabres are now adorned as seen in pictures on this page. The squadron is commanded by S/L. F. M. Hegarty, A.F.C., and





is equipped with Canadair-built North American Sabres of the Mk 4 pattern, powered with the General Electric J47 turbojet. The base at Bruggen (as a *Flight* representative saw during Exercise Battle Royal) is of NATO pattern and vast in scale. From the perimeter track it is possible to look into Holland, and the base commander explained that it would be a disadvantage for the Sabres to be based up near the front line, for on the climb their forward speed was so great that they would be obliged at least once to turn their backs on the enemy. From Bruggen, on the other hand, it was possible to do a straight climb. Moreover, the Army were not embarrassed by having to look after the squadrons in the forward areas.

On the occasion of the revival of the sharks'-teeth emblem it is appropriate to recall that this appeared in America as well as on "112's" Tomahawks and Kittyhawks. With this same insignia, in fact, together with the miscellany of national markings shown in the picture on the opposite page, the 15,000th Curtiss fighter for World War II (a Warhawk) took the air in 1944.

Operation Deep Freeze

Early Stages of the American Antarctic Air Operation

AS we reported in our news pages last week, the air component of "Operation Deep Freeze"—America's Antarctic expedition in preparation for the International Geophysical Year—suffered a sudden setback when parts of the ice runway in McMurdo Sound showed signs of breaking away; further flights over the Antarctic Continent were accordingly postponed until the second phase of Deep Freeze, next October. With McMurdo Sound as their advance "airfield," the aircraft had been brought in from various airfields in New Zealand, and the accompanying notes on various aspects of the operation—written before the postponement decision was made—are from a correspondent in the Dominion.

FOR "Operation Deep Freeze," seven ships of the U.S. Navy and eighteen aircraft, designated Task Force 43, are to establish at the Antarctic up-to-date camps to accommodate scientists who will take part in the Antarctic phase of the International Geophysical Year surveys during 1957-58. Forty nations are participating in the Geophysical Year activities, which are expected to disclose scientific data of much value to humanity.

The U.S. expedition is probably the largest peace-time project of its kind yet attempted and will cost an estimated half a billion, repeat billion, dollars. Although some of the aircraft, with their special navigational and scientific equipment, are worth about three million dollars each it is recognised that they are expendable and may never return.

Battered by ice-laden head-winds in the latter stages of their flight, two Neptunes and two Skymasters made the 2,000-mile hop to an ice-strip landing at McMurdo Sound in the Ross Sea after a rocket-assisted take-off from Christchurch's international airport at Harewood on December 20th. This was the first time that aircraft had flown to the Antarctic from an outside landmass. The Neptunes were equipped with skis, but the Skymasters had to rely on wheel landings on the snow-covered ice runway. On the same day a more uncertain flight by two Albatross Triphibians and two DC-3 Dakotas—setting out from Taieri, about 200 miles farther south—failed when these slower aircraft had to turn back because of severe head winds.

A useful navigation check on the final stages of the Polar Ocean crossing was expected to be the active volcano Mount Erebus, the smoke from which is visible for many miles. It is not far from the base camp of Captain Scott's last expedition. The U.S. expedition has already reported finding the base camps of both Scott and Sir Ernest Shackleton in surprisingly good states of preservation.

During the first flights, on December 20th, the weather information provided by the New Zealand forecasters proved much more reliable than that supplied to the U.S. pilots from their own Antarctic-based ships. This was freely commented upon by Cdr. Ben Sparks, senior pilot in charge of the flight waiting in New Zealand at the time of writing. The forecasting of the winds which made the aircraft turn back on December 20th was "peerlessly accurate," said Cdr. Sparks.

In New Zealand there was intense national interest when, in the early hours of December 20th, the first Neptunes took off from Harewood Airport, for it was the first time that most of the onlookers had seen a JATO take-off. Each aircraft carried a crew of five. They engaged the attention of photographers in the chilly first light on the Canterbury Plains as they put on their complicated selection of survival clothing. The first aircraft, a P2V commanded by Lt-Cdr. William ("Trigger") Hawkes landed at McMurdo Sound about thirteen hours later. The four aircraft were severely iced-up in the latter stages of their flight.

The take-off was at the same airport and at about the same time of day as the arrival of the Canberras which flew in to dominate the placings in the London-to-Harewood international air race in October 1953. Here, too, Sir Charles Kingsford-Smith

(*Concluded on page* 118)

In the heading picture is one of the Grumman Albatross Triphibians. On the right, Lt. Ellena attends to the ski-and-wheel landing gear of one of the Neptunes. Below is a line up of "Deep Freeze" aircraft on the tarmac at R.N.Z.A.F. Station Wigram—Skymaster, Albatross, Dakota, Neptune, and another Skymaster.

Communications

Rescue

Minesweeping

Reconnaissance

Supply dropping

Trooping

Casualty evacuation

WESTLAND WIDGEON

THE Westland Widgeon is the latest general-purpose, medium-size Helicopter to be built in Britain. It is a development of the famous and versatile Dragonfly and incorporates many of the well-tried and highly successful engineering features which have been responsible for the outstanding success of Westland Helicopters.
With accommodation for four passengers and pilot — or two stretcher cases, medical attendant and pilot — it offers great possibilities for many civil and military roles.

WHIRLWIND

THE Westland Whirlwind Helicopter is now available with the Alvis Leonides Major Engine as an alternative to the standard Pratt and Whitney Wasp. This powerful British engine gives the Whirlwind enhanced load lifting and hovering ability and increases the height attainable in forward flight. These additional attributes of a Helicopter that has already been proved during world-wide civil and military service are particular considerations where operation is required in countries where high atmospheric temperatures, humidity and altitude are determining factors.

WESTLAND—THE HALLMARK OF BRITISH HELICOPTERS

WESTLAND AIRCRAFT LIMITED : YEOVIL : ENGLAND

40,000 ft. apart

Squadron Leader J. S. Fifield, D.F.C., A.F.C., by a recent successful ejection at ground level, demonstrated the capability of the latest Martin-Baker fully automatic ejection seat to bring about safe escapes near the ground at low forward ejection speeds. A further important requirement of an ejection seat lies in its high altitude performance. Martin-Baker fully automatic ejection seats are designed to bring the seat occupant safely down from the ejected altitude, stabilised and under control, to a selected altitude at which parachute deployment and separation of the occupant from the seat is automatically performed.

The altitude of the live ejection demonstrated at Chalgrove on October 25th was over 40,000 feet, and the altitude of separation 10,000 feet.

Martin-Baker

AIRCRAFT COMPANY LIMITED

BOEING 707 REVELATIONS

New Data on the Seattle Family of Jet Transports

FIRST-HAND information on the development of the Boeing 707 family of jet transports was given to *Flight* last week by Mr. A. T. Curren, Boeing preliminary design engineer. For the past three months Mr. Curren has been backing up a 707 sales team on a tour of European operators, and it was on the day of his departure for Seattle that we discussed the aircraft with him.

No inside knowledge is required to see that competition between Boeing and Douglas has reached a peak, each company offering—and selling—remarkably similar jet transports. This is the reason, presumably, for Boeing's decision to release information on the 707 which has previously been restricted to the higher councils of a limited number of major airline operators. With the exception of engine performance, there were few aspects of the aircraft which Mr. Curren was not prepared to discuss.

Before outlining the development background and design philosophy behind the 707, he gave Boeing's answer to the various doubts, printed and spoken, which have been cast on the company's ability to make good its performance and delivery promises. And here we must say that the quiet confidence of the Boeing argument, and the absence of derogatory references to competitive products, struck us as no less convincing than the reasoning behind it. These were some of the points made:—

Boeing's studies on the design of the 707 had been in progress since 1949, and the 367-80 prototype, embodying the major results of those studies, had been flying for 19 months. In that time it had "racked up" 375 hours of flying. From the B-47 (over 1,000 delivered) and B-52 (in quantity production at Seattle and Wichita), Boeing had built up unrivalled experience in the design and production of large, multi-jet, high-speed aircraft.

Deliveries of production B-47s had begun within three years of the prototype's first flight (late in 1947), and the equivalent period for the B-52, a much more complicated aircraft, had been only a few months longer. The interval allowed between the first flight of the 707 prototype and initial deliveries to airlines was more than four years. As the civil aircraft was a less complex machine than either of the bombers, and embodied the experience accumulated with both, this period seemed adequate.

Jigging and tooling for production of the KC-135 tanker, which had the same aerodynamic shape and the same systems as the 707, had been completed and the first production model would fly before the end of this year. By November 1958, when first airline deliveries of certificated 707s were due, KC-135s were expected to have completed 50,000 hours' flying.

As to engines, Boeing were completely confident that the J57 (for the 707-120) and the J75 (for the 707-220 and -320) would give the power required at the times stipulated in the development and delivery programme. They were not permitted to disclose future ratings for either type of engine, or actual thrust figures now being achieved. The Rolls-Royce Conway, which was not at a more advanced stage of development than the J75, could be installed at an operator's request, but the programme did not depend on it.

Three 707 Variants

As first reported in the preceding issue of *Flight* there are three airframe-engine combinations in the 707 family, the characteristics of which are outlined in the accompanying table. The "basic" Stratoliner is the 707-120, which is intended to be the most versatile of the three, operating at a lower direct seat-mile cost than the "classic" DC-6B over routes of 500-4,000 miles (the all-important coast-to-coast route, of some 2,500 miles, is thus well within its capabilities). Its wing area of 2,433 sq ft was matched to the J57 turbojet which, to quote Boeing, "was offered at 12,500 lb s.t. at sea level, with a potential future growth programme culminating in 1960."

For operators with field-length problems, the 707-220 is being developed, embodying larger and more powerful J75s but retaining the basic "small-wing" airframe. This will be the fastest of the three aircraft and it will have slightly more range than the 120, but take-off performance will be its key characteristic.

The 707-320 is to be a specialist long-hauler designed for the North Atlantic and similar long over-water routes: hence the name Intercontinental. Wing area will be increased to 2,908 sq ft; the fuselage will be 10ft longer. In the design of the 320, the company claims, full allowance has been made not only for the adverse weather and headwind conditions encountered on the North Atlantic route, but also for the increasing traffic-control problems which might well be expected by the time the aircraft enters service. The Intercontinental, they say, should thus have sufficient endurance in hand to operate—when required to do so—below the optimum cruising altitude and without recourse to pressure-pattern flying or inflexible cruise-climb procedures.

There is no intention of offering the 707 prototype for certification or of building further prototypes. Final phases of airworthiness testing will thus be undertaken with production Stratoliners. Delivery of the first certificated 707-120s is planned to take place in November 1958, though the programme calls for delivery of non-certificated production aircraft to both PanAm and American Airlines some four months earlier for crew training and route proving.

Thrust reversers and silencers will be standard equipment on the 707; design of both devices is well advanced. Boeing have tested several silencers based on the designs of Mr. F. B. Greatrex of Rolls-Royce, Ltd., and four corrugated tailpipe nozzles are now being fabricated for the 707 prototype. A braking parachute is fitted to the prototype as a "back-up" device, but fully duplicated wheel-brakes and thrust reversers are expected to obviate the need for parachutes on production 707s; nor is there any present intention of using afterburning, jet flaps or boundary-layer control. The company states that its intention is to make the 707 "as simple and fail-safe an aeroplane as it is possible to build."

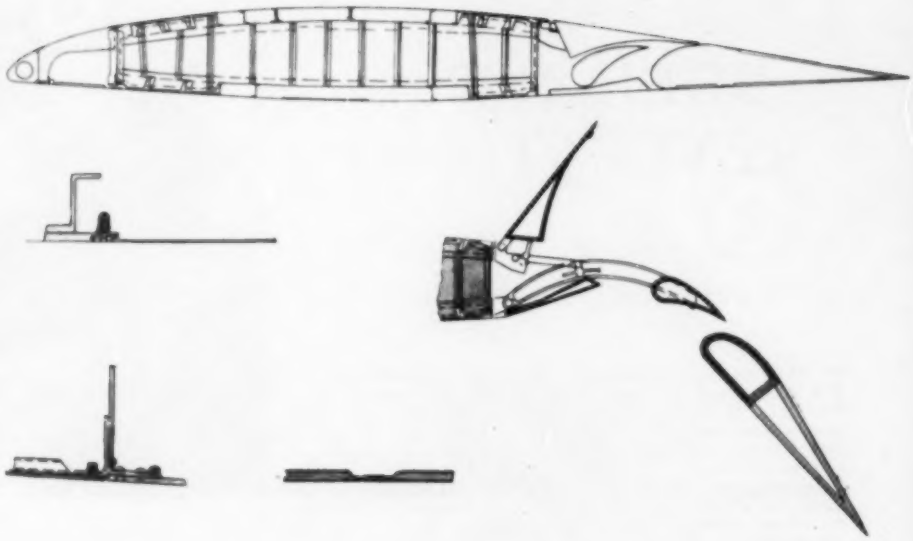
No decision has yet been taken on the question of whether or not to tank-test a complete fuselage. However, Mr. Curren told us that Boeing will certainly "go under water" with sections of the pressure cabin. The designed differential pressure for the aircraft, incidentally, is 8.6 lb/sq in.

A feature of the civil 707 which has attracted some comment is the extremely large number of cabin windows, which will, in fact, be spaced at intervals of only 20 inches. Mr. Curren briefly explained the reasoning behind the "concept of the small window" which, he said, had been pioneered by Boeing. By far the most important reason for the decision was the assumption that at some time in the life of the aircraft a window would fail. The smaller the window, the less violent would be the decompression and the less serious its effects. Incidental factors were that, assuming equal structural strength, the desired "lighted area" could be obtained at a lower weight penalty; that 20in spacing of windows eliminated the problem of lining-up seats with windows in a

CHARACTERISTICS OF THE BOEING 707 FAMILY

	707-120	707-220	707-320
Power unit (P. and W.) ...	JT3C-4 (J57)	JT4A-3 (J75)	JT4A-3 (J75)
Gross weight (lb)	247,000	258,000	295,000
Max. landing wt. (lb) ...	165,000	175,000	195,000
Optg. wt. empty (lb) ...	111,000	116,000	128,670
Zero fuel wt. (lb.)	155,000	160,000	175,000
Design payload (lb)... ...	31,250	31,250	38,000
Fuel capacity (U.S. gal) ...	17,398	18,078	23,580
Wing span (ft, in)	130 10	130 10	141 6
Aspect ratio	7.06	7.06	6.92
Wing area (sq ft)	2,433	2,433	2,906
Fuselage length (ft, in) ...	128 10	128 10	138 10
No. of seats (1st cl.) ...	109	109	122
Usable cargo (cu ft) ...	1,290	1,290	1,500
Max. cruise speed (m.p.h.)	592	608	599

BOEING 707 REVELATIONS . . .



Newly released, this page from the Boeing 707 brochure shows (top) a typical section of the two-spar wing; the trailing-edge detail (right) illustrates operation of spoilers and flaps. The smaller details show an example of sandwich construction (right), and sections through the front spar (lower left) and, above it, under-wing access door.

convertible interior; and that the extra windows provided aisle-seat passengers with a far better view.

Design Characteristics

Mr. Curren then went on to discuss in more detail the design developments and characteristics of the 707, and his remarks are summarized below under appropriate sub-headings.

Aerodynamic development.—The wind-tunnel testing programme, which was still continuing, was conducted primarily in the Boeing wind tunnel, though two other tunnels were employed occasionally. The Boeing tunnel, with a test section of 8ft by 12ft, and capable of transonic testing up to M = 1.3, was the largest privately owned high-speed wind tunnel in the world. [The programme of tunnel testing on the three large Boeing multi-jet types —B-47, B-52 and 707—is summarized in the accompanying table.]

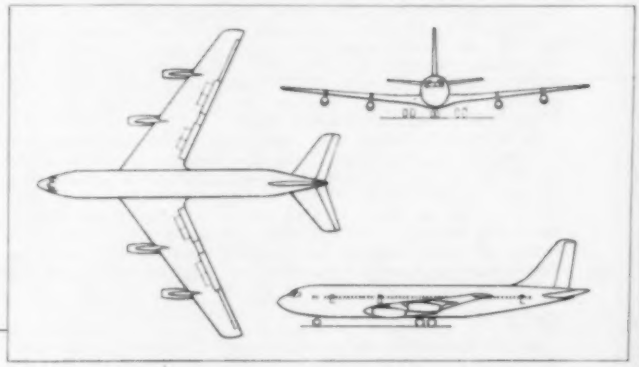
As the aerodynamic investigations and the concurrent structural and flutter tests continued, it became clear that a 35 deg swept wing represented the best compromise for a long-range, load-carrying aircraft designed to cruise near 550 m.p.h. This sweep permitted moderate wing thickness, resulting in high structural efficiency, ample fuel-carrying capacity and a high critical Mach number. In addition, it presented no stability and control problems that could not be satisfactorily solved with existing knowledge.

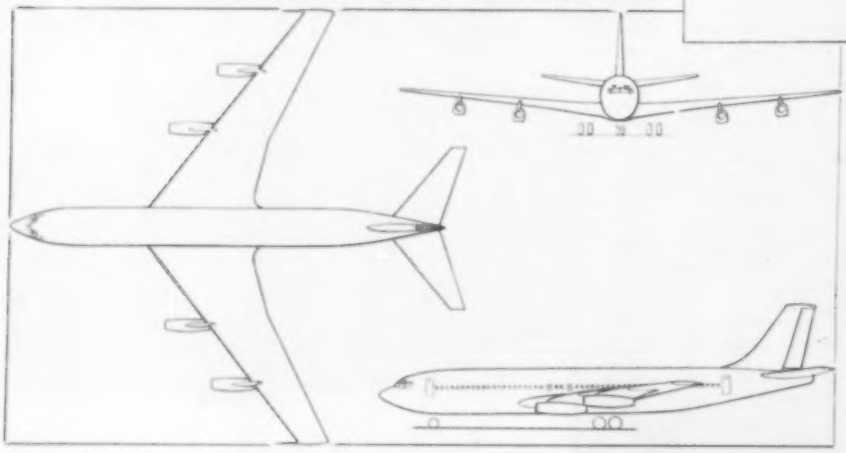
Control and stability.—Design objectives under this heading could be summarized as follows:—

(a) The control system must be fail-safe.
(b) The aircraft response must be superior to, and the pilot-effort required less than in, previous transports, to improve the all-weather operating ability of the jet transport by reducing the pilot's workload.
(c) The finished aircraft must be an "honest" machine, in that no pitch-up or tuck-under should occur at high speed. The stall characteristics must be excellent with ample stall warning and effective control must be available in the fully stalled condition.
(d) Landing and taking-off, both in calm air and strong crosswinds, must not require new or unique piloting techniques or more than reasonable pilot proficiency.

[Before discussing the control system of the 707, Mr. Curren recalled the main features of the corresponding systems of the B-47 and B-52.] The former was a most responsive and easily controlled aircraft. All surfaces were hydraulically controlled with double boost systems on the ailerons to reduce the probability of complete failure. In addition, a manually-operated control system was also installed to provide reasonable control by the pilot if all hydraulic fluid is lost—"an ever-present hazard." The chief virtue of a hydraulic control system on a subsonic transport or bomber aircraft was that it allowed the designer to disregard unfavourable control-surface hinge moments or protect against unknown effects by using the "brute strength and awkwardness" of hydraulic pistons. Failure of such a system at high speed might result in serious control difficulties. Eventually the designer was forced into providing a manual back-up system, thus increasing weight and complication. The B-47 was an example of this development.

The B-52 control development profited by B-47 experience. On the B-52, the ailerons, elevators and rudder were manually controlled by pilot-operated control tabs. The stabilizer was adjustable, positioned by dual hydraulic motors, and provided with an emergency hand-crank adjustment in the event of hydraulic failures. To improve the low-speed lateral control characteristics, spoilers were mounted on the upper wing surface, operating in conjunction with the ailerons. These hydraulic spoilers also served as air brakes to increase drag as required by the pilot for steep descents or to reduce speed. This aircraft was a good step forward to a fail-safe control system for a high-speed configuration. After extensive flight tests and system refinement, the B-52 could





Latest general-arrangement drawings of the "small-wing" Boeing 707-120 (above) and the 707-320 Intercontinental (left). Some of the differences between the two airframes are indicated by the following dimensions (figures for the 707-320 in parentheses): wing span, 130ft 10in (141ft 6in); overall length, 134ft 6in (146ft 8in); height, 38ft 3 in (38ft 11in); tail-plane span, 39ft 8in (51ft 8in); cabin exterior width, 12ft (12ft 4in); distance between fuselage centre-line and inner-pod centre-line, 27ft 2in (32ft 6in). Undercarriage track of both versions is 22ft 1in.

be described as a "one-handed aeroplane." All operation from take-off to landing, including violent manœuvres, could be conducted by the pilot with only one hand on the flight controls, leaving the other available for cockpit operation.

The 707's control system was, in Boeing's view, the "ultimate development of a fail-safe and responsive system." All primary controls were operated by control tabs and balanced by unique pressure-plate balances located forward of the surface hinge-lines. The stabilizer was manually adjusted by the pilot except for large trim-changes occasioned by large speed-changes or operation of the wing flaps. In this event, a small electric motor actuated the manual stabilizer trim system for the pilot, if he so desired. The wing-mounted spoilers were the only hydraulically-operated surfaces.

Complete loss of the dual hydraulic systems merely reduced the crosswind landing capability of the 707 from approximately 35 m.p.h. to 10-12 m.p.h. of crosswind component. In this event, of course, both the landing gear and wing flaps must be lowered manually. The pilot control-forces and flight-stability characteristics of the 707 were "deemed superior by the many airline and military pilots who have flown the aircraft, thus indicating that Boeing design objectives have been attained with a fail-safe system."

Structural philosophy.—In the case of the 707, this might be briefly summarized as follows:—

(a) Anticipate that structural integrity will inevitably be compromised by flight or ground damage or collisions, defects in manufacture or faulty maintenance in service.
(b) Select the structural design criteria to control the consequences of such damage. Test and redesign and test again to substantiate the validity of the design criteria. Thus Boeing had provided a fail-safe structure that could absorb damage without sudden or rapid progressive failure, thereby providing ample time for routine inspection to detect any structural damage.
(c) Establish close liaison with each operator to aid in maintaining the original design reliability.

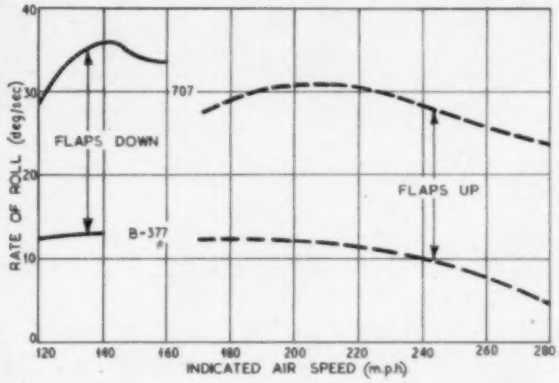
In order to satisfy this design philosophy, many specific design criteria had to be established and confirmed by component and/or full-scale tests. A few general examples could be listed:

(a) Provide multiple load-path structure such that a single component failure will not cause the structure to fail. This could be applied, for example, to the attachment points for the vertical fin, control-surface hinges or the more complex structure around cutouts for windshields, doors and windows.
(b) Provide tear resistance by incorporation of tear-stopping reinforcement material and/or selecting low working stress levels.
(c) Select low working stresses to preclude abnormal fatigue maintenance or inspection requirements.
(d) Provide ample fatigue endurance after partial failure to provide adequate time for discovery of any failure.
(e) Use plug-type doors, hatches and windows to eliminate catastrophic failures of latches and hinges.

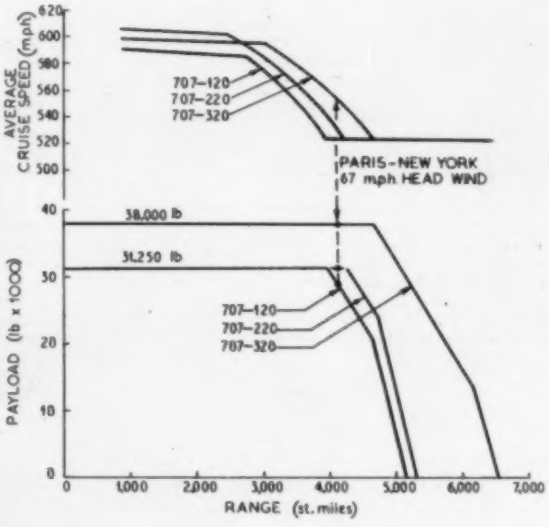
When creating a light and efficient structure, a designer had to rely heavily on past experience. Thus the extensive structural tests completed on the B-47, B-52 and prototype tanker-transport were of great value. The B-47 and B-52 had been static-tested on the ground and flight-tested to establish loads and load distribution under all manœuvres. Flight-load testing had already been accomplished on the prototype 707, as well as flight flutter tests to ensure a flutter-free structure at all speeds up to M=0.95. Fatigue testing of critical wing joints, splices, and structurally complex areas or sections was now being accomplished at Seattle. Additional fatigue tests on fuselage components, body tear-resistance tests, and, later, full-scale body fatigue tests were planned. As this work proceeded and was evaluated, additional testing would be planned as required. [*Continued overleaf*

Subject	No. of models	Type of model
Aerofoils ...	30	Two-dimensional
B-47 wings ...	34	Complete, three-dimensional
B-52 wings ...	68	Complete, three-dimensional
707 wings ...	53	Complete, three-dimensional
Nacelles	308	Pod and strut configurations
Flutter	24	Complete dynamic-response models

Tabulated above are details of wind-tunnel testing carried out by Boeing in the development of their three large multi-jet projects—B-47, B-52 and 707. Aerodynamic tests accounted for 10,093 wind-tunnel hours, and flutter-test time totalled 4,930 hours.

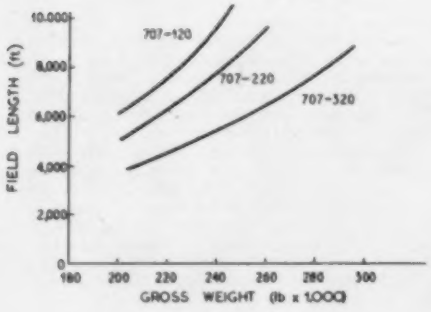


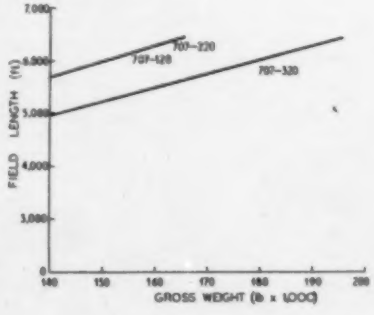
Comparison of rates-of-roll of the Boeing 707 (upper curves) and Stratocruiser.



(Above) Payload and cruising speed (upper graph) are here plotted against range for all three versions of the Boeing 707. Each is assumed to take-off at maximum gross weight, and allowance is made for fuel reserves of 1,600 U.S. gal (707-120) and 1,700 U.S. gal (707-220 and 707-320).

The curves below for the Boeing 707 family show C.A.R. field lengths required for take-off (left) and landing at sea level I.S.A. Though its landing requirements are relatively modest, the 707 will apparently need rather longer take-off distances than are generally available at major airports today if its payload-range capabilities are to be fully exploited.



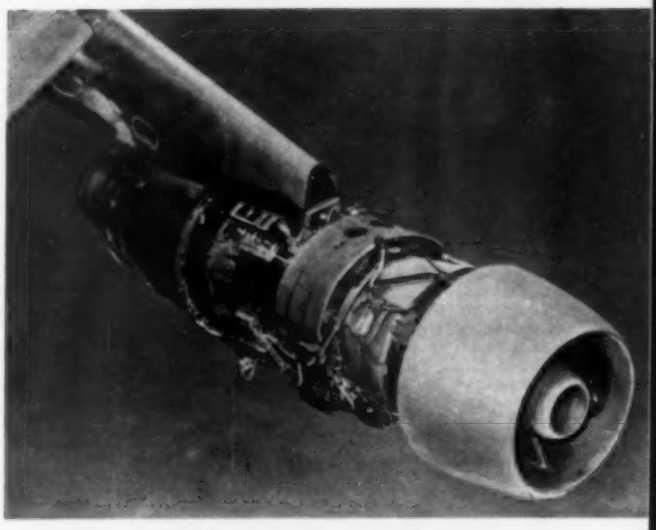


BOEING 707 REVELATIONS . . .

Powerplant.—Some of the important factors leading to selection of the pod installation were:—

(a) Aerodynamic design freedom not compromised by engine installation requirements.
(b) Efficient wing structure free of cutout areas.
(c) Ability to install readily a new production-model or prototype engine for testing.
(d) Safety in the event of powerplant fire.
(e) Freedom to locate the engines to minimize flutter problems.
(f) Ease of maintenance.

Systems.—The major change from conventional practice in the Model 707 was the introduction of the 400-cycle, 115-volt alternating-current system for electrical power. Many years ago, on the B-47, engine-driven alternators had been installed to supplement the basic direct current generators. The next step, on the B-52, had been to eliminate the D.C. generators and all electrical power was derived from a system of A.C. alternators. These furnished the "muscle" to drive fuel pumps, stand-by hydraulic pumps and similar heavy loads, while a lightly loaded D.C. system supplied control power to valves, relays and similar functions. The D.C. system power was derived from simple transformer-rectifier units to supply the conventional 28-volt D.C. system. The Model 707 series would employ four 30 kVA alternators, each driven from an engine by a Sundstrand constant-speed drive unit. The system could operate paralleled, for load sharing, or as four individual alternators, each supplying specific loads in the event of a malfunction, at little loss in efficiency. The hydraulic and air-conditioning systems were completely conventional.



One of the major virtues, accessibility, is vividly illustrated by this view of an uncowled J57 on the Boeing 707 prototype.

TWO RECENT BOOKS

"Studies for Student Pilots" by Michael Royce. Sir Isaac Pitman and Sons, Parker Street, Kingsway, London, W.C.2. Illustrated. Price 25s.

THIS concise collection of hard facts, figures and brief explanations is designed to ease the passage of a student pilot through the difficulties of examinations for the Private Pilot's Licence and (to a certain extent) the Commercial Pilot's Licence. One's first impression is of the scope—so extremely wide, it seems, for so small a book. "Meteorology is the science of the weather" begins part 1, page 1. Rapidly one is whisked through chapters on met. (but how *did* those photographs of the Cirrus Minor and Cheetah engines fit in?), theory of flight and airframes, navigation, instruments, piston-type aero engines; appendices on the tephigram, flight weather, power and performance, application of radio D/F. loop bearings, supercharging, and miscellaneous items. "A.36 (d) (viii) Enter the residual deviations on a compass card and also in the aircraft logbook," the text proper ends, 272 pages later. By all means—but we certainly need a rest before turning to "further reading" on the opposite page.

Unlike vodka, this book should be sipped slowly. It is an exceptional feat of condensation, with an impressively high ratio of facts to pages. Many pilots will be glad of this aid to reference and revision, while beginners will ask fewer silly questions of their instructors with this book in their map-pocket. The sort of book, in fact, that will need to take a lot of page-thumbing, will save a lot of effort and prevent many mistakes, and should have been published much sooner.

"Song of the Sky," by Guy Murchie. Martin Secker and Warburg, Ltd., 7 John Street, London, W.C.1. Illustrated, price 21s.

A SIGNIFICANT addition to aviation literature has been made with the recent publication of *Song of the Sky*, by Guy Murchie, an American writer and navigator. His ambitious object was to give (in effect) a complete, accurate yet exciting "travel-talk" of the air ocean that is the sky, and of all that moves therein. To say simply that he has succeeded with a degree of poetry is an understatement.

It is difficult to think of any section of the reading public who would not find in this book a source of interest, information, wonder or inspiration. It gives the general reader a wide insight into the airman's world; it gives the aeronautical specialist an account of how man and his machines enter and pass through the basic, timeless ocean of the sky. For pilots, already-wide horizons are widened still further, and a feeling for the air is made richer; while for much-travelled passengers who find an airline journey merely boring, the book can guarantee to take their eyes from *The Times* on their lap to the wonders outside the cabin window.

From the navigator's seat of a transatlantic Skymaster, the author looks on these wonders, describes them, and moves far in space and time to relate individual aspects to the whole picture. The art of navigation from the earliest days . . . the structure of the atmosphere, the many moods of weather . . . man's exploration of the sky . . . bird flight . . . supersonics. . . . . The facts of history and experience, told with imagination, are punctuated with real-life anecdotes, flying stories which ram home the vagaries of the sky, the unexpected influences on man's flying machines—stories to which every pilot can add his own.

At a brief glance *Song of the Sky* might appear to be only an imaginatively written popular text-book on navigation and meteorology. It is, as we have tried to indicate, much more than this. It is illustrated throughout by the author's pleasant and stimulating sketches, and concludes with a chapter on what might be called a philosophy of the air age. Many pilots and flying men, notoriously reticent in expressing their beliefs in print, will perhaps tend to recoil from references to ultimate truth; the paradox of reality; time, the accelerator; and the increasingly imaginable perspectives of infinity. Certainly many will suspect or disagree with some aspects of this philosophy. Nevertheless, they will find in this chapter, we suspect, sudden shafts of common experience and thought—and, indeed, a great deal to think about in general.

OPERATION DEEP FREEZE

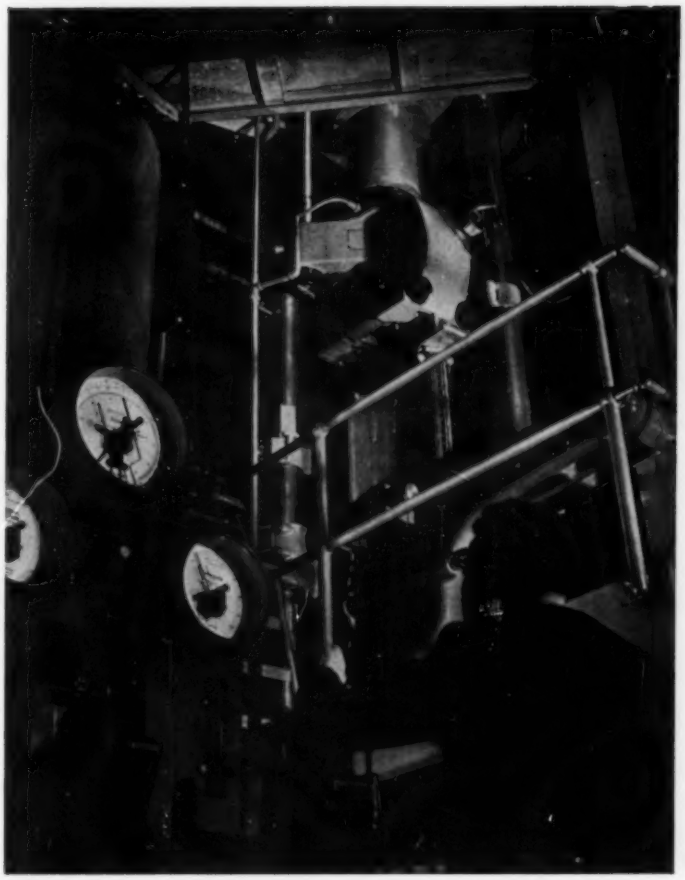
(*Continued from page* 114)

landed in the *Southern Cross* when he made the famous first Tasman Sea crossing in September 1928.

When the second stage of "Operation Deep Freeze" is launched, the smaller aircraft will make the biggest polar air-drop in history. They will set down about 500 tons of prefabricated huts and camp buildings and stores at the Pole. The aircraft will also help with aerial mapping, magnetic detection and the supervision of a 500-mile-long route along which crawler units will haul about 600 tons of gear across crevasses and mountain territory to establish another scientists' camp in Marie Byrd Land.

The expedition's air strength has already been depleted by the loss of an Otter during a recent crash on the ice, in which three men were injured. A helicopter was also lost when it crashed and sank in Lyttelton Harbour on December 14th.

In the meantime, the staging through New Zealand airports of the U.S. aircraft on their way to Antarctica during the next year or two will provide the biggest fillip yet to Dominion aviation. The 18 aircraft already engaged comprise the following types:—Two Lockheed Neptunes equipped with wheel-and-ski landing gear, two Douglas DC-4 Skymasters, two Grumman Albatross Triphibians (equipped for sea, snow or normal ground landings), two Douglas DC-3 Dakotas, four ski-equipped D.H. Canada Otters and six Sikorsky helicopters.



HIGHLY FATIGUING

THIS impressively big piece of machinery installed at the ENGLISH ELECTRIC Research Department at Warton was the first machine of its size available to the aircraft industry in this country.

It is a hydraulically operated and electrically controlled static and dynamic tester. For static tests it can apply steady loads in tension or in compression of up to 200 tons. Its physical size makes it easy to do full-scale tests of substantial structural joints. But it is as a dynamic tester, for research into the vast problem of fatigue, that it has an almost unique value. For this machine can apply any required load up to 100 tons at any required frequency up to 600 cycles per minute. You might think that when 100 tons is vibrating 600 times per minute, all hands at Warton have to stop work to prop up the building. You would be wrong. You have to put a hand on the machine before you can feel whether it is running or not.

With equipment like this at the disposal of a design team wedded to the principle that knowing is better than guessing, ENGLISH ELECTRIC are uniquely equipped to do those months of arduous finding out on the ground which will later save some of the more arduous years of trying out in the air.

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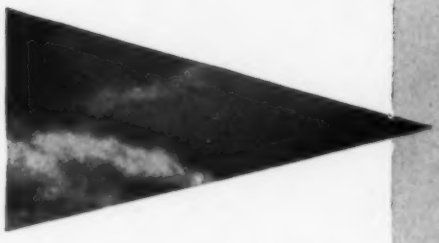
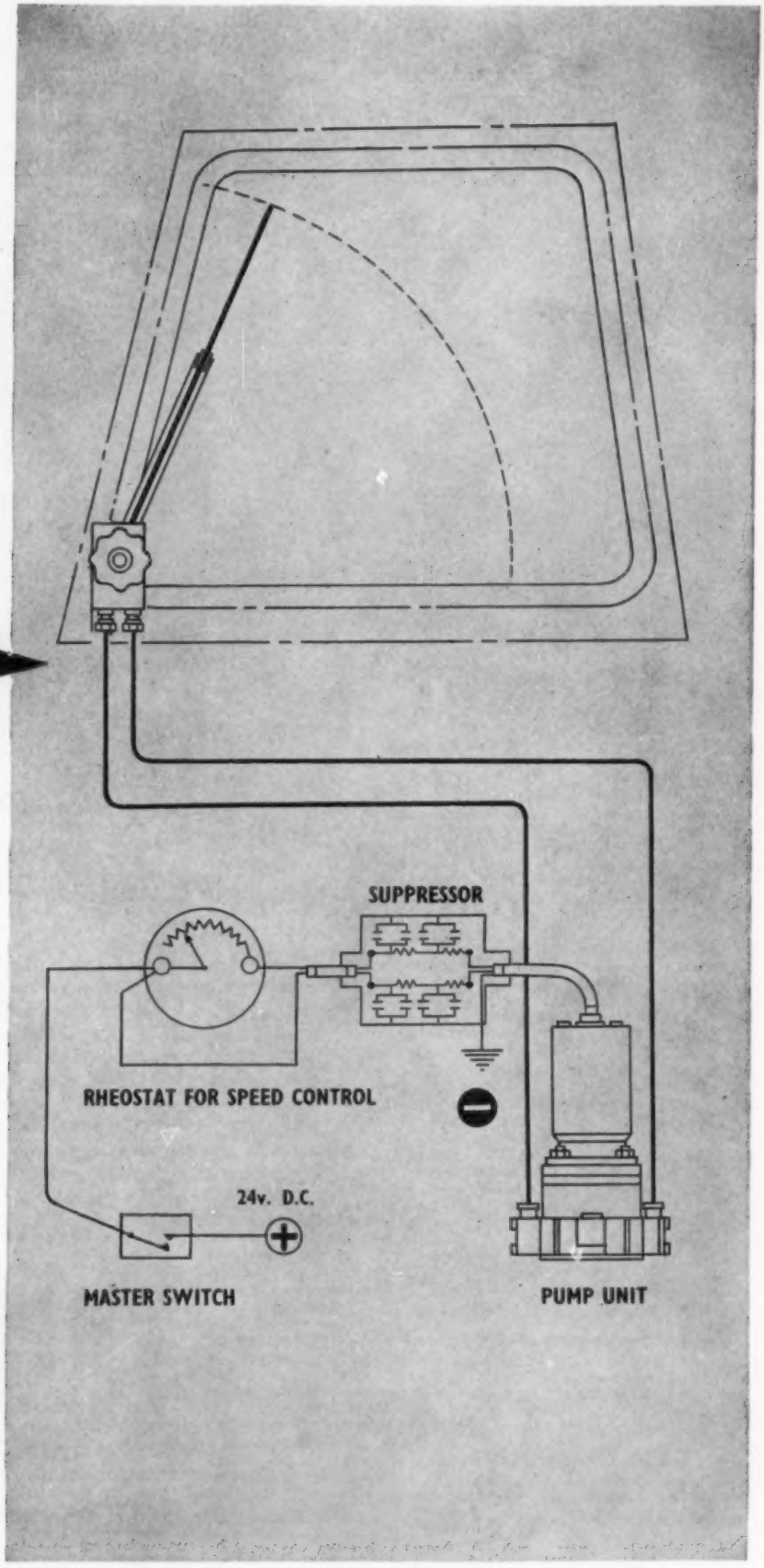
PUSH & TURN TO PARK



DUNLOP


SUPPRESSOR
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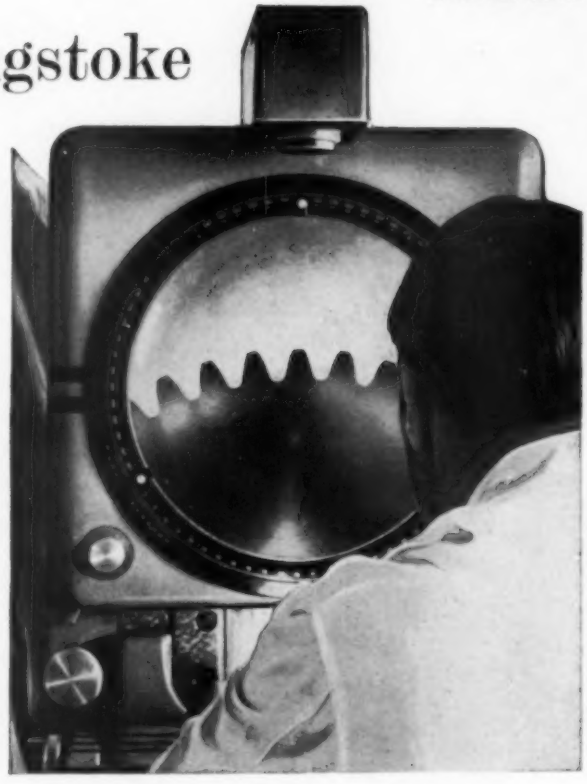
180 DP* AT Basingstoke



* Diametral Pitch

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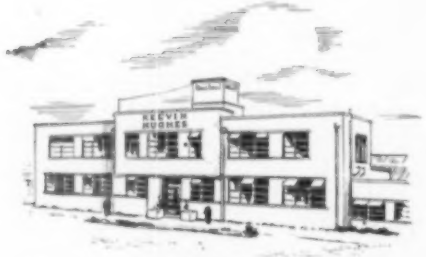
Magnified 100 times, a tiny gear wheel for a high-range sensitive altimeter is projected on a screen at Kelvin Hughes Basingstoke factory. By this means, small gears can be checked with great precision against a large scale drawing to ensure maximum performance in the finished instrument.

The same care and precision that go into its construction characterise all the equipment made by companies in the Smiths Group.

The resources of the Group are considerable. They include specialist factories, development laboratories and field service facilities. The progressive manufacturing and advisory service of the Smiths group of aviation companies has given them a foremost place in the field of modern instruments for all flight conditions.



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TGA. SM30

The Consolidated-Vultee PB2Y-5R Coronado referred to in the letter from Aerojet. On the right, the A.T.O. motor is being jettisoned.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

On Pressing-on Regardless

I HAVE read with interest the contribution *Thoughts on Airliner Utilization* by E. T. House in *Flight* dated January 13th. I am more than surprised, however, that he should clearly advocate a policy of aircrew utilization that has proved so disastrous in the past. I had thought that this policy of "press on regardless" had died with most of those who practised it shortly after the end of the war.

No one really believes that the airline captain deliberately delays a service just for the sake of delaying it. He is as anxious to get on with the job as Mr. House would want him to be, but he has learned that the minor snag may develop into a major fault. One of our most experienced pilots has been heard to say that as far as flying is concerned he has become "an old woman" and the longer he flies the more of "an old woman" he becomes. He is still flying, while some of our "press on regardless" types are no longer with us.

There can be no tampering with safety in an industry where so much that is dangerous can develop so rapidly from what may, in the eyes of those who do not want to see, be a "minor snag."

London, W.1. D. FOLLOWS,
Secretary, the British Air Line Pilots Association.

IN reply to Mr. E. T. House's comment on aircrew in his article *Thoughts on Airliner Utilization,* in *Flight* for January 13th, may I suggest that "The aircraft must go through" should become the aircrew's watchword only after the point of no return has been reached. Before that point safety must, surely, at all times predominate.

Admittedly, the author referred to minor snags; however, it is sometimes the minor snag which results in a major disaster during flight.

London, N.W.2. L. F. E. COOMBS.

Jettisonable A.T.O. Motors

YOUR fine article on the de Havilland Super Sprite in the August 5th issue was read with interest. In the last paragraph, on page 188, the statement was made ". . . it is believed that the unit is the first jettisonable liquid-propellant A.T.O. motor to go into service anywhere."

May we respectfully call your attention to the fact that in 1943 our company made a liquid-propellant A.T.O. powerplant which saw service in the Army Air Force on the Douglas A-20 and the Consolidated B.24? This A.T.O. unit developed 1,000 lb thrust for a duration of 25 sec. After release from the airplane, it was lowered by parachute. The propellants used were nitric acid and aniline oil, and the system was pressurized with nitrogen.

In 1944 a similar type unit was produced for the U.S. Navy. The thrust was raised to 1,500 lb and the duration to 38 sec. Both the Navy and the Coast Guard used this A.T.O. unit quite successfully during and following the war. We are enclosing two photographs which show the use of this A.T.O. unit on the PB2Y-5R airplane.

Azusa, California. AEROJET-GENERAL CORPORATION,
W. L. Gore, Director of Sales.

Britain's New Airliners

THE letter by "Torquemada" in your issue of December 16th and those from D. W. Sutherland and J. Rodgers on December 30th raise some interesting questions. "Torquemada's" suggestion that the Vanguard should be shelved in favour of the Britannia 100 can hardly stand up to examination. As pointed out in your footnote to Mr. Rodgers' letter, the Britannia even in its 100 form is intended for longer stage-lengths than the Vanguard, and it appears that only over the longer stages of the range bracket for which the Vanguard is intended, i.e., 500-2,500 miles could the Britannia offer comparable economy of operation. A further strong point in the Vanguard's favour is its freight-carrying capacity, enabling it to break even when operating at a load-factor of some 30 per cent.

However, in view of the generally accepted fact that the industry is attempting too much, it is obvious that our civil airline programme must be streamlined if it is ever to obtain its fair share of the £2,500m worth of orders which will be placed over the next ten years, and a critical survey of the prospect and achievements of the industry would not appear to be out of place at the present time.

Our main attack on world markets in the past (and, judging by recent events, in the future also) will be with four aircraft, namely, Viscount, Vanguard, Comet and Britannia, followed to a lesser extent by the Herald, perhaps the Accountant, and the Twin Pioneer. The Viscount's success is too well known to require further comment and a total production of 350-400 does not appear to be too optimistic. One point which, as far as can be seen, has been completely overlooked in this country is that Vickers-Armstrongs with the Viscount are practically wholly responsible for the reputation which Britain holds as a manufacturer of civil aircraft—a fact which makes the V.1000/V.C.7 cancellation all the more difficult to understand.

I must disagree entirely with Mr. Rodgers when he says that the market for non-stop transatlantic aircraft, i.e., of the DC-8/V.C.7 type, is small in terms of numbers of aircraft. Like a large number of other people he appears to think that aircraft of this type are restricted to two routes only, namely, the American coast-to-coast and the Transatlantic runs. Of the coast-to-coast myth, one has only to point out that three of the American domestic carriers (Eastern, Braniff and National) who have ordered big jets never have operated, and never will operate, on that route; neither will the transatlantic-only idea hold water as, of the five major carriers who have ordered jets, one, PanAm, cannot possibly use all 45 on this route alone—although their Pacific service will take some off. Of the others, two have publicly announced that their 707s will fly on other routes in addition to their non-stop services to New York, and it is a safe assumption that S.A.S. and K.L.M. intend to do likewise. Only one major airline on the North Atlantic remains to order for the sixties—T.W.A., and without doubt a fair proportion of their inevitably large jet order will be taken up by aircraft to fly through the Middle and Far East; thus on practically all of B.O.A.C.'s routes heavy competition is to be expected from 1960 onwards by the big West Coast jetliners.

(Continued overleaf)

CORRESPONDENCE . . .

The order by Japan for DC-8s is a further indication that the big jet market extends over a far wider range than many people seem to think, and there is no reason to suppose that the big Commonwealth airlines will hesitate to order from the United States to combat the aforementioned competition. In particular, Qantas are hardly likely to be content with the Britannia as a replacement for Super Connies, although a Comet order here must not be discounted. B.O.A.C.'s failure to back the V.C.7 is one of the most lamentable decisions in British post-war aviation and behind it appears to be the fact that they over-ordered Comets and Britannias in an attempt to get one jump ahead of the rest of the world, leaving no choice but to reject any more advanced projects.

One point which should be made, to correct a widespread belief that the V.C.7 and 1,000 are one and the same, is that this is not so—even to the extent of complete wing redesign, a fact revealed in the House of Commons debate on December 20th.

In spite of the fact that the Britannia is 20 months late—originally first delivery was scheduled for May 1954—its future success should in no way be diminished, as without doubt it will be the most dominating aircraft on world air routes from mid-1956 to mid-1960; and, with the world's leading turboprop advocates behind it, it seems set for a long and successful future. I feel, however, that the same cannot be said of the Comet, great aircraft though it undoubtedly is. The year 1959 looks to be two years too late for quantity orders to be forthcoming; it obviously could not be made available much earlier, even with greatly increased effort and the possibility of it becoming a second Ambassador—in other words, an aircraft giving great service to its operator but no (or few) orders to its manufacturer—must be greatly reckoned with.

In view of this, two possibilities reveal themselves as solutions, either a reversal of the V.C.7 decision or a great chance to re-equip Transport Command with enough high-performance aircraft to enable it to provide global mobility to our military forces.

The Herald and Twin Pioneer appear to have great futures, both being aircraft with big potential markets, solid, simple construction, and backed by go-ahead thinking enabling their respective builders to lay down production lines without firm orders. The Herald especially seems to have an assured future in view of the orders so far placed.

Chatham, Kent. R. HORLOCK.

Belgian Commanders of R.A.F. Squadrons

WITH reference to the December 30th issue of your magazine, I noticed that in the paragraph titled "Belgian Squadron Commander" on page 983, you mentioned that Major Kaisin of the Belgian Air Force is the first Belgian to command an R.A.F. squadron.

I wish to point out that he is far from being the first one: in fact, the first foreign officer to command an R.A.F. squadron was a Belgian. He was W/C. Le Roy du Vivier, D.F.C. and Bar, who, after having fought during the Battle of Britain with No. 43 Sqn., was posted back to the same squadron at the beginning of January 1942 as squadron commander. He is presently attached to Sabena and is their director-general for North America.

Brussels. Commandant HOUART V.A., Belgian Air Force.

[The statement in question should have been qualified by the words "under the R.A.F./Belgian Air Force exchange scheme."—Ed.]

FORTHCOMING EVENTS

Jan. 27. S.L.A.E. (London): Discussion "Responsibilities and Problems of Flight Engineers."
Jan. 31. R.Ae.S.: Graduates and Students Section: "Laminar Flow Aircraft Design," by J. B. Edwards.
Feb. 2. R.Ae.S.: Section Lecture: "New Ideas in Plastics for Aircraft Structures," by J. E. Gordon, B.Sc.
Feb. 7. Institute of Transport: Informal Luncheon.
Feb. 8. Air-Britain: "The Conquest of Space in the Light of New Developments," by P. Moore.
Feb. 9. R.Ae.S.: Section Lecture: "Propellers for Military and Civil Aircraft," by L. G. Fairhurst, M.I.Mech.E., F.R.Ae.S.
Feb. 10. Helicopter Association: "Engineering Aspects of Helicopter Bus Operations in City Centres." Three papers introduced by J. S. Shapiro, Dip.Ing., A.F.R.Ae.S. (at 5.30 p.m.).
Feb. 11. British Interplanetary Society: Birmingham Branch: "Aerodynamic Considerations of an Orbital Rocket," by W. F. Hilton, Ph.D.
Feb. 13. Institute of Transport: Brancker Memorial Lecture.
Feb. 17. Air Transport Auxiliary Association: Annual Dinner, Eccleston Hotel.
Feb. 16. R.Ae.S.: Main Lecture at Yeovil: The First Stringfellow Memorial Lecture, "Stringfellow—His Life and Work," by Dr. A. M. Ballantyne, T.D., B.Sc., A.F.I.A.S., Hon. F.C.A.I., A.F.R.Ae.S
Feb. 21. R.Ae.S.: Section Lecture: "Design of Low Landing Speed Aircraft," by R. C. McIntyre, A.F.R.Ae.S.
Feb. 23. Aerodrome Owners Association: Annual General Meeting, and Annual Dinner.

R.Ae.S. Branch Fixtures (to February 23rd):

Jan. 30, *Henlow*, Lecture by W. H. Lindsey. Jan. 31, *Belfast*, "Pressing, Stretching and Bumping," by L. Fromson. Feb. 1, *Gloucester*, "Aircraft Fatigue," by H. Giddings; *Weybridge*, R. K. Pierson Memorial Lecture. Feb. 2, *Brough*, "Some Meteorological Problems of High Altitude Flight," by P. J. Meade. Feb. 6, *Derby*, "Propeller Turbine Engines for Naval Aircraft," by W. H. Lindsey. Feb. 7, *Boscombe Down*, "The Future of Air Power," by Air Marshal Sir Robert Saundby. Feb. 8, *Manchester*, "The Artificial Stabilization of Modern Aircraft," by Dr. K. H. Doetsch. Feb. 10, *Brough*, Annual Dinner Dance. Feb. 13, *Henlow*, Annual General Meeting.

Feb. 14, *Bristol*, "Aerial Photography," by Charles E. Brown. Feb. 15, *Coventry*, Lecture by E. P. Hawthorn; *Reading and District*, Lecture and Film Show on Guided Weapons. Feb. 16, *Isle of Wight*, "Operation of Turbo-Propeller Aircraft," by P. G. Masefield; *Yeovil*, Main Lecture (see above). Feb. 21, *Belfast*, "The New London Airport," by R. F. Bulstrode. Feb. 22, *Weybridge*, "Training and Research in the Field of Aircraft Production," by Prof. J. V. Connolly. Feb. 23, *Cheltenham*, "The Investigation of Flutter by Flight Tests," by H. G. Peacock.

Rare Lightning

I DO not like to disagree with *Flight*, as I think it is a very good aviation magazine, but on page 965, December 30th, you state: "This is almost certainly the first Lightning seen in this country since about 1946." I saw a Lockheed Lightning on Wednesday, July 6th, 1955, at 2150 hr. It was flying south towards Oxford.

Kidlington, Oxford. G. HENRY MURDAY.

Soviet Navy Fighters

ALTHOUGH I have long been aware that the Russian Navy possesses squadrons of shore-based, jet-propelled, strike aircraft, I had not heard it suggested until recently that this same Service is operating modern jet fighters. It would be interesting to know which types—if any—are in service.

London, S.W.1. F. JONES.

[Mig-15s and Mig-17s are in service, and a recently acquired photograph of machines of the latter type appears below.—Ed.]

IN BRIEF

A Canadian reader, Mr. Robert Brown, wishes to get into touch with any ex-members of a Coastal Command squadron who knew his uncle, W/AG. Wallace Brown. Our correspondent quotes the unit as "No. ? Demon Squadron," and says it was equipped with Hudsons and, for a time, Wellingtons. His address is Amherst R.R. No. 5, Nova Scotia.

The Mig-17 ("Fresco") fighters on the left are some of those operated by the Russian Navy (see "Soviet Navy Fighters," above). Although the quality of the photograph is poor, it can be seen that they are carrying flush-fitting under-wing tanks, tapered to a cone at the rear. On the right, men are being transferred from a Soviet "W"-class submarine to a "Hound" helicopter.

THE INDUSTRY

For Britannia Operators

THE formation of a new major department, responsible for all engineering servicing and training on Bristol aircraft—with special emphasis on the Britannia—has been announced by Bristol Aircraft, Ltd. The new department is a development of the former service organization, and will come directly under the managing director, Mr. Peter G. Masefield. It will be headed by Capt. J. C. Harrington, O.B.E., F.R.G.S., formerly Deputy Operations Director (Operations) of B.O.A.C., who now joins Bristols as general service manager; Mr. T. W. Campbell has been appointed service and training manager in the department.

Capt. Harrington.

Capt. Harrington was born in Sheffield in 1904, and joined the R.A.F. at the age of 15½ as a boy artificer at Cranwell, gaining his Wings six years later. He joined Imperial Airways in 1932 and was promoted captain in 1935. In 1937 he was one of the first pilots of the Empire flying-boats operating to South Africa and the Far East, and on this type of aircraft he surveyed a new route from Britain through the Belgian Congo, linking with the service from Cairo to South Africa.

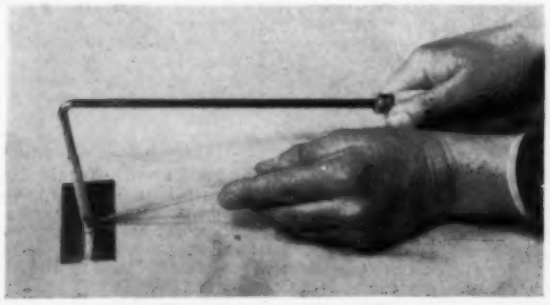
Late in 1942 Capt. Harrington was appointed flight captain of B.O.A.C.'s home-based flying-boats, in addition to being chief flying instructor, and in May 1943 became Acting Superintendent of Operations. He was appointed manager of all the Corporation's aircraft based in the United Kingdom in 1944. After a period as technical manager of B.O.A.C.'s Eastern Division, he was made manager of the Argonaut fleet and was engaged in development liaison work with the manufacturers of this type from the early stages of operation.

Holder of one of the first Master Pilot's Certificates endorsed for both landplanes and marine aircraft, Capt. Harrington has flown about 14,000 hr on many types of aircraft, and has nearly twenty-five years' experience of airline operation.

Developments in Aluminium Soldering

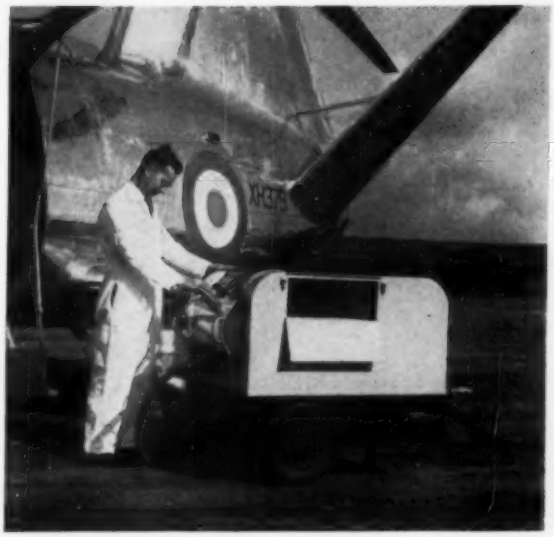
TWO new developments in soldering aluminium are announced by Tiltman Langley, Ltd., of Redhill. The first is a lightweight soldering tool for the fluxless soldering of aluminium with any normal solder used for this purpose. The second is a solder designed to make corrosion-resistant joints in high-strength aluminium alloys or cold-worked aluminium without, it is claimed, any appreciable weakening of the material. It has been used to study the possibilities of soldering aluminium at the comparatively low temperature of 250 deg C.

These products are a result of the company's work on a Ministry of Supply development contract concerned with aluminium soldering. The tool is used in conjunction with an electric hotplate for raising the work to the soldering temperature. The technique is to apply the solder and lightly brush the surface being tinned with a guarded refractory brush on the tool, any of the usual cleaning techniques having been previously applied to the aluminium; no flux is used. After tinning, the surfaces to be joined are placed together and a neat fillet of solder produced by sweeping through the molten solder with the refractory brush.



The Tiltman Langley lightweight soldering tool in use.

The Tiltman Langley solder, which has been subjected to salt-spray and humidity tests, is stated to have shown good corrosion-resisting properties in aluminium soldered joints, and to provide good mechanical properties. A shear strength of 2½ tons/sq in has been obtained in such joints.



This 24-volt lightweight battery-operated ground power unit, seen in attendance on a Bristol 173 helicopter, is the Auto Diesels Type O. Integral charging is provided by a 1.2 b.h.p. four-stroke engine with 0.4 kW generator. A peak current of 600 amp is delivered for 30 sec. The manufacturers are Auto Diesels, Ltd., of Uxbridge, Middx.

Smiths Sales Appointment

IT is announced that Mr. Kenneth James Dowell, A.R.Ae.S., has joined the technical sales department of Smiths Aircraft Instruments, Ltd., as a senior representative dealing with automatic pilots, flight systems and radio navigation instrumentation.

After serving an apprenticeship with Handley Page, Ltd., Mr. Dowell joined the Fleet Air Arm and became a fighter pilot and, subsequently, an instructor at the Naval Advanced Instrument Flying School. He went back to Handley Page after the war as a design draughtsman. In 1947 he joined the Sperry Gyroscope Co., Ltd., as a field service engineer, and later became aeronautical services superintendent and then superintendent sales engineer. He joined S. G. Brown, Ltd., in 1955 as a liaison engineer engaged with the design team on current developments in aircraft gyros. Mr. Dowell is 35 years of age.

Portable Lighting Equipment

A NEW type of battery-operated lighting equipment utilizing fluorescent tubes should have useful applications in certain stages of aircraft assembly work. Made by Easco Electrical (Holdings), Ltd., Brighton Terrace, London, S.W.9, the equipment includes a vibrator, step-up transformer and associated control gear, and the output from the converter is fed to two trough units accommodating 18in fluorescent tubes. A 30W lighting output, it is stated, is given for a battery drain of only 4 amp at 12 volts. The equipment is also available for 24-volt operation. An original application was for ultra-violet illumination, using 15W "black light" fluorescent tubes.

Expanded-metal Merger

THE whole of the share capital of the Cressall Manufacturing Co., Ltd., of Birmingham, has been acquired by the Expanded Metal Co., Ltd., of London and West Hartlepool. The products of the Birmingham company are complementary to those of the electrical division of the Expanded Metal Company, whose northern factory makes electrical resistors and heaters.

Col. H. F. G. Langley, C.B.E. (director, Expanded Metal) and Mr. W. F. Knight (chief executive of the electrical division) have

THE INDUSTRY . . .

been elected to the Board of the Cressall Manufacturing Co., Ltd.

The electrical division of the Expanded Metal Company was formed before the last war, when the possibilities of using "expanded metal" as a rapid dissipater of heat were first appreciated. During the war very large numbers of resistors were made for the Admiralty and the Ministry of Supply, and it was found that, in addition to its rapid heating and cooling characteristics, expanded metal also had the ability to stand up well to shocks.

The company's "Expamet" resistors and heaters are used in a wide variety of development and other processes, among which, it is stated, are the testing of engines for the Bristol Britannia and other aircraft, and in high-pressure heater equipment for aeronautical research. The products of the Cressall Manufacturing Co., Ltd., also well known, are designed to cover a lower current range.

Rapide and Tiger Moth Spares

THE manufacturers have announced that changes are to be made in the methods of supplying spares for the D.H. Dragon Rapide and Tiger Moth, both of which have now been out of production for some ten years. Routine production of spares is to be discontinued, but if there is a constant demand for any particular part in quantity its manufacture may possibly be continued. In some cases manufacturing drawings will be available in lieu of the components. The de Havilland Aircraft Co., Ltd., suggests that all operators of these aircraft should review their spares requirements on a life provision basis and place their orders accordingly.

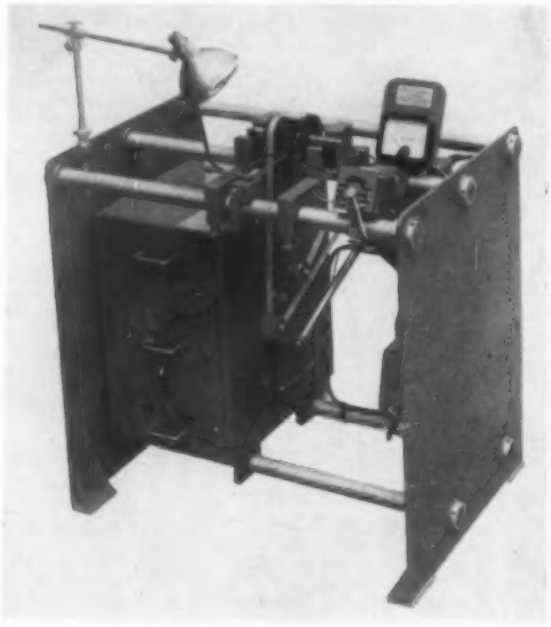
Dynamic Balancing

IN the past, some dynamic-balancing machines have tended to be sensitive to variation in frequency and voltage of the supply current. In a new product designed by Mr. J. B. Clifton and manufactured by Small Electric Motors, Ltd., of Beckenham, Kent, good performance and reliability are claimed to have been achieved together with improvements which make the behaviour independent of supply variations.

As the accompanying photograph shows, the machine consists of a framework carrying the rotating component (which can weigh from a few ounces to over 100 lb) and a cabinet housing the electronic circuitry. The test piece is placed in two half-bearings free to move in the horizontal plane and is belt-driven from a synchronous motor. Transducers sense axial vibration and transmit signals to a pair of tuned amplifiers of novel design. These employ no ferrous inductance, the use of capacitors is minimized and tuning to the speed of the test piece is accomplished by variable resistances. The use of high-gain amplifiers and feed-back of a large proportion of all frequencies, except that produced by the out-of-balance, should result in high selectivity.

Normally the S.E.M. machine is so adjusted that a bearing displacement of 0.000025in will produce a steady deflection of one-tenth full scale on the meter, but the same deflection can be obtained with only one-twenty-fifth as much displacement.

These particulars refer to 2,000 r.p.m., but higher sensitivities are obtained at increased speeds. The equipment used in the machine is of a robust nature and careful attention has been paid to accessibility, ease of maintenance and calibration and testing. In the photograph a stroboscopic lamp can be seen illuminating the work.



The new Clifton Dynamic Balancer, referred to above.

Maintenance Inspections by X-ray

AT the invitation of the Carl Drenck X-ray Laboratories, thirty representatives of British and Continental aircraft manufacturers and airlines met in Copenhagen last month to discuss the use of X-rays for maintenance inspection of aircraft.

It was clear from the discussion that very considerable headway has been made during recent months. More X-ray sets have been installed and there has been progress in working out and improving radiographic techniques as well as in selecting areas of the structure to which X-ray inspection can be applied with advantage. It seems that the lead previously held by America in this field has been much reduced, and it was also apparent from the discussion that the technique inspection is now well out of the experimental stage in Europe.

Carl Drenck are manufacturers of Fedrex portable X-ray sets. So far six airlines and two aircraft manufacturers are using this equipment, which is supplied in the United Kingdom by Inspection Equipment, of 19 Broad Court, London, W.C.2.

IN BRIEF

Keelavite Rotary Pumps and Motors, Ltd., of Coventry, announce that their telephone number is now Meriden 441.

* * *

Thompson Bros. (Bilston), Ltd., announce that, following the retirement of Mr. A. J. Lowe from the London office after 36 years' service as manager, Mr. C. W. Wiles from the Bilston headquarters has been appointed to the post.

* * *

Quasi-Arc, Ltd., of Bilston, Staffs, have issued a new edition of their booklet, TC.850, describing their range of A.C. transformer welding sets. Equipment described includes a new lightweight air-cooled set, two new multi-operator sets and the redesigned Twin-Arc set. The booklet includes a useful section on power factor correction.

* * *

Following considerable expansion of their activities at home and overseas, Automotive Products Co., Ltd., and their associated companies, Lockheed Hydraulic Brake Co., Ltd., and Borg and Beck, Co., Ltd., have appointed the following executive directors: Messrs. C. Clench, C. Hayes, A. R. W. Murray, F. Rowarth, P. A. Rippon, J. K. Simpson, H. Unsworth, and D. J. Watkins. They will act as members of an executive management board.

* * *

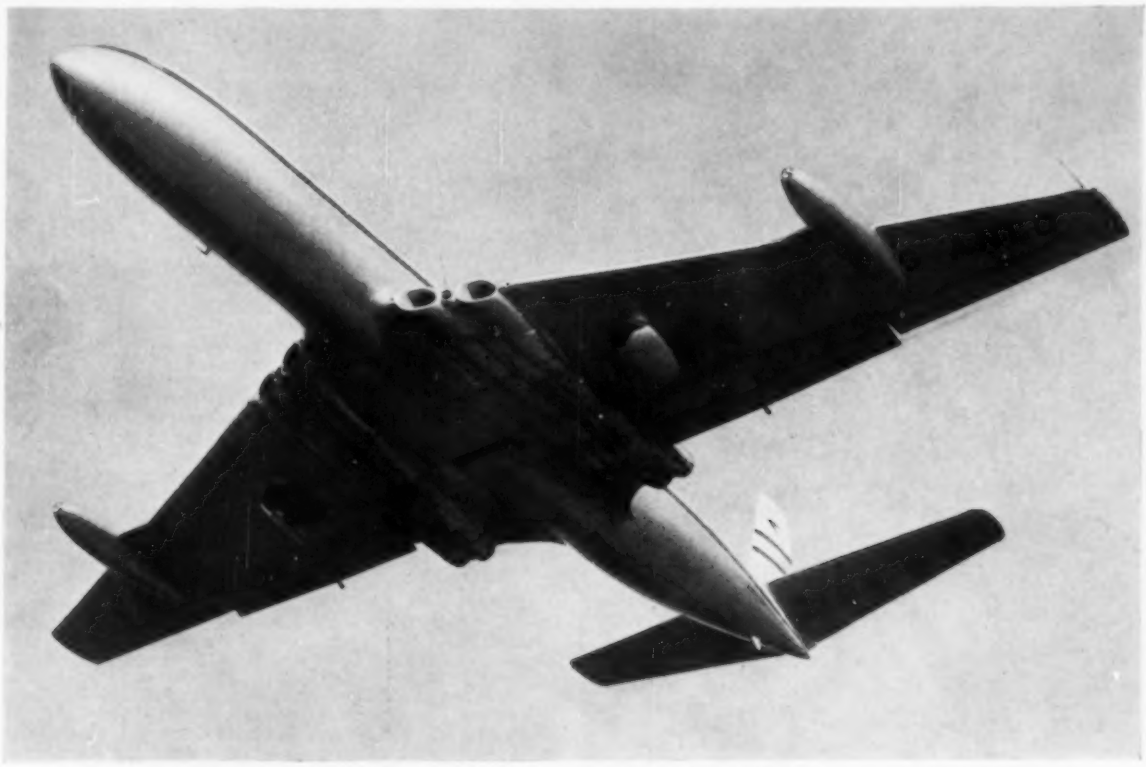
International Aeradio announce an order from Vickers-Armstrongs (Aircraft), Ltd., for the supply of an engineered system for the air traffic control tower at Wisley Airfield. Two single-position I.A.L. A.T.C. desks are to be provided, and the approach control room is to be equipped with two control units for two radar operators and one unit for the D/F. operator. Six-channel transmitter receiver equipment is being supplied and will be installed by I.A.L.

* * *

Dagenite batteries (Peto and Radford, Ltd.) are being used on two current Antarctic expeditions. For the ground starting of the two Sikorsky S-51s operating from the *Oluf Sven* on the Graham Land expedition, Autair, Ltd., have chosen a trolley carrying two Dagenite 6-HZP21G 12-volt batteries, each of 100 a.h. capacity; and special Dagenite lightweight batteries are fitted to the Auster aircraft accompanying the Trans-Antarctic expeditions.

* * *

Four new appointments have been announced by the British Aluminium Co., Ltd. Mr. S. F. Derbyshire will relinquish his post as general production manager on reaching retiring age on February 17th, but will continue in a consultative capacity. Messrs. W. B. C. Perrycoste and J. Salter will assume the posts of joint general production managers from that date. Mr. P. T. Ensor has been appointed general manager of the Canadian British Aluminium Company at Baie Comeau, and Mr. A. R. Wylie has become works manager designate of the Canadian company, after relinquishing his post at the Lochaber works.



Power in plenty: a stirring study of the Comet 3 as it snapped smartly away from the Hatfield runway on a recent test flight.

CIVIL AVIATION

BULGING ORDER BOOK I

AT the end of the Old Year the Lockheed Aircraft Corporation's order book accounted for military and civil aircraft and spares valued at £429m. About one-third of this, £120m, is for Super Constellations, of the 1049 and 1649 series, and Electras—a sum which, a Lockheed press release observes, represents nearly double the annual civil and military export volume of the British aircraft industry. In all, seventeen airlines have purchased 177 of these aircraft. The best-selling airliner, despite the continued strong demand for Super Constellations, was the Electra, which has accounted for £66m worth of contracts (total to date is 104 aircraft) since it was announced last June.

BULGING ORDER BOOK II

DURING 1955 the Douglas Aircraft Co. received orders for 328 commercial transport aircraft—capable, the company claims, of providing as much capacity as all the airliners in service six years ago. Valued, with spares, at $1,125m (£400m), the 1955 orders raised the backlog for Douglas airliners to a total of 388 aircraft worth $1,267m (£442m). The 98 DC-8s ordered last year represented a total value of $596m (£212m)—nearly half this amount. Piston-engined aircraft of the DC-6/7 series accounted for the remainder, the exact break-down of types yet to be delivered at the end of the year being as follows: 18 DC-6As; 86 DC-6Bs; 82 DC-7s and 7Bs; and 104 DC-7Cs.

LUFTHANSA TO SOUTH AMERICA

AN agreement concluded between Lufthansa and the Brazilian airline VARIG, it is reported by West German radio, anticipates the opening on August 15th of a regular service to Latin America, and the renewal of old-established German airline operations to the South American continent. It is likely that the North American and South American terminals of Lufthansa's transatlantic services will be linked by VARIG, and details of the co-operative service were being discussed in Cologne by VARIG's president, Snr. Ruben M. Berta, on January 19th.

B.E.A.'s RECORD YEAR

BRITISH EUROPEAN AIRWAYS handled 23 per cent more traffic during 1955 and produced a total revenue of more than £20m. The majority of the 2.15 million passengers carried in this period flew in B.E.A.'s 26 Viscounts and 20 Elizabethans, which were worked at an average utilization of about 2,200 hr per aircraft. There was an increase in freight during the year of more than one-fifth; nearly 7m ton-miles were produced.

Commenting on the results, B.E.A.'s chairman, Lord Douglas of Kirtleside, said that capacity increased by about 24 per cent, against an average increase in staff numbers of only three per cent, giving an increase in productivity of more than 20 per cent measured in capacity ton-miles produced by each member of the staff—"a fine effort by all." The cost of the capacity ton-mile was reduced by about 10 per cent in a year of rising wages and material costs.

Lord Douglas added, however, that the capacity ton-mile could not be used as a basis for comparison of the relative efficiency of different airlines; indeed, there was no simple index that could be used for such a comparison. "I am frequently surprised," said Lord Douglas, "that this simple truth is not understood by so many public commentators on airline affairs."

Profit for the first seven months of the current financial year, April to October, was nearly £2½m, although a loss occurred during November, the month of the French air traffic control strike. The one millionth Viscount passenger was carried in January 1955.

TWIN PIONEER PROPOSITION

SCOTTISH AIRLINES, the operating subsidiary of Scottish Aviation, are understood to have submitted a proposal to the Ministry of Transport and Civil Aviation to employ open ground at Wormwood Scrubs (eight miles from the centre of London) as an airfield for the Scottish Aviation Twin Pioneer.

This move is of interest in view of the arguments put forward for the use of the short take-off Twin Pioneer for city-centre

CIVIL AVIATION . . .

to city-centre transport. It has been claimed that if the Paris airfield at Issy, near the Eiffel Tower, were used, travel time between London and Paris could be reduced by as much as 1½ hr because of the shorter city-to-airport times.

Reporting on a recent visit to the Prestwick factory of Scottish Aviation, Ltd., a correspondent says that the second Twin Pioneer is nearing completion in the experimental department and that the fuselage of the third is virtually complete. It is hoped that the prototype will have finished its certification trials around the end of March. Meanwhile, Scottish Aviation are believed to have letters of intent for 30 Twin Pioneers, which would absorb production up to mid-1957.

VANGUARD OR ELECTRA FOR K.L.M.?

A CORRESPONDENT in Holland reports that K.L.M. are likely in the near future to purchase additional turboprop transports. The company has already placed an order for nine Vickers Viscount 803s. It is understood that the new order will be for about ten aircraft, and that the choice lies between the Vickers Vanguard and the Lockheed Electra. The president of K.L.M., Mr. I. A. Aler, and Prince Bernhard of the Netherlands are at present in the United States, where they are visiting West Coast aircraft firms, including Lockheed. The primary purpose of the visit, however, is to discuss the possibility of a K.L.M. service linking Amsterdam with Los Angeles, possibly *via* Montreal.

DEMONSTRATING A JET TRANSPORT

WHATEVER the cost to Boeing of the private-venture 707 prototype, it is already clear that the company's investment has paid very high dividends. Boeing have exploited to the full their ability to show an aeroplane, rather than a design study, to potential customers, and the demonstration-flight programme carried out over the past few months has certainly been a powerful factor in obtaining orders.

According to Boeing design-engineer A. T. Curren, whose interview with *Flight* last week is fully reported elsewhere in this issue, the normal routine is to give the guest pilot the full freedom of the left-hand seat—including the option of making the first take-off, circuit and landing without prior demonstration. Himself a pilot of wide experience, Mr. Curren claims that, for its size, the 707 is the "most docile airplane ever built."

Some impressions of a typical demonstration flight in the 707 have been given in *The Flight Deck*, published by American Airlines for their crews, by Mr. W. W. Braznell, the airline's director of flying operations. With Mr. Dan Beard, assistant vice-president (research and development) of A.A., Mr. Braznell flew in the 707 last September. Some extracts from his account are given below:

"I had been asked to take a look at the Boeing 707 cockpit as part of an evaluation team looking over new airplanes. En route to Seattle I was informed there might be a ride in the 707 in store for us. I visualized the usual bucket-seat, windowless flight associated with prototype demonstrations, with the added attraction of a glimpse of the instrument panel over someone's shoulder—if you were lucky. . . . Motioning to the left seat, Tex Johnston asked of Dan Beard and myself, who wanted the first go at it. . . . The thought immediately occurred to me that (a) Johnston considered Dan and me finished jet pilots or (b) he knew his craft was so easy to handle that even a couple of desk pilots could not get into trouble with it. The answer of course was that Johnston knew Dan had little experience on jets, I had none at all, and both of us were desk pilots. . . . For the next hour-and-a-half we really had fun. For myself the flight was easily the most exhilarating of my flying career, and I'll include my solo ride in this statement. From a purely flying standpoint, the airplane was less of an initial puzzle than was the case when first introduced to the DC-4, Convair or DC-6. Dan's first take-off and landing were smooth as silk. Mine, while not as well executed, would have gotten by on any airline . . .

"While weather threatened to close the field (which had neither G.C.A. nor I.L.S.) and thus held our flight to low altitudes, 2,000 and 3,000ft, Tex had no reluctance to demonstrate engine- and engines-out (on the same side) performance. As a matter of fact, we did slow flight and stall nibbles with gear and flaps down while 2,000ft above terrain. My impression from these manoeuvres was that the airplane has the greatest forgiveness factor of any I have ever flown.

"The acceleration and deceleration capabilities of the 707 were of course very impressive, but even though expecting great things in the way of a quiet, vibrationless cockpit, I wasn't ready for what I found. You must experience it to believe it. The only thing disturbing the churchlike quiet of the front end was the clacking of the fuel totalizer, a sound problem that must be brought to the attention of the instrument manufacturer."

I.C.A.O.'s 1956 ASSISTANCE PROGRAMME

THE International Civil Aviation Organization has announced detail's of its technical assistance programme for 1956. Under the terms of the programme, I.C.A.O. undertakes to train and advise re'atively undeve!oped countries in such matters as construction and operation of aero:dromes, the training of technical personnel, operation of radio aids, and traffic services. The 1956 programme calls for aid of this kind to 27 countries, and its total cost will be of the order of £400,000.

The principal areas with which I.C.A.O. are concerned this year are South America and the Middle East. The training centre in Mexico City is being expanded to transform it into a regional centre for the whole of Latin America. More than 200 technical personnel—radio operators, traffic controllers, inspectors, etc.—have already graduated and it is estimated that the establishment will be able to supply about one-half of the needs of Latin America for new technical staff during the next two years.

In the Middle East, where there are a number of small I.C.A.O. training establishments, participants in the 1956 programme will include a licensing and training officer, a maintenance and certification engineer, and a check-pilot examiner. These officials will help Middle East countries to improve training methods and licensing standards. There will also be instruction in fire-fighting and rescue. A 1951 mission of nine I.C.A.O. experts in Iran has given advice on airline operations and the training of personnel, and the 1956 programme will continue this work with more emphasis on air navigation facilities. Similar assistance will be given to the Governments of Iraq, the Lebanon and Syria.

In Afghanistan internal development of civil aviation is held up by lack of personnel and facilities, even though aviation activity has increased considerably since the appointment of an I.C.A.O. adviser in 1952. The new programme provides for continued advice to the Government, and for technical training of personnel. Aid will be given in the installation and operation of new ground equipment purchased by the Government and assistance will be given in the construction of airports. In Egypt the I.C.A.O. mission at Almaza airport will expand its activities and will help in the installation of new radio aids.

There has been an I.C.A.O. mission in Ethiopia since 1951 and a civil aviation school at Addis Ababa has trained airframe and engine mechanics, radio operators, traffic controllers, and meteorologists; the 1956 programme will continue the work of the school and provide for more on the spot training. Some 200 technicians have so far graduated, but demand continues to be greater than supply. The Government of Guatemala is pursuing a vigorous policy of civil aviation expansion and the resident I.C.A.O. engineer assisting in radio and communications training will be joined in 1956 by a meteorological and airport official. In Indonesia a major civil aviation development plan has gone ahead with I.C.A.O. assistance, and the continued development of air transport within the Indonesian chain of islands will be met with an expansion of training facilities. The Indonesian aviation Academy, with the support of the Government, has already trained a large number of personnel in all aspects of air transport.

BREVITIES

An agreement has been signed between Japan and France for a service between Tokyo and Paris by both westbound and eastbound routes. Japan has also signed an agreement with Australia for J.A.L. services between the two countries.

* * *

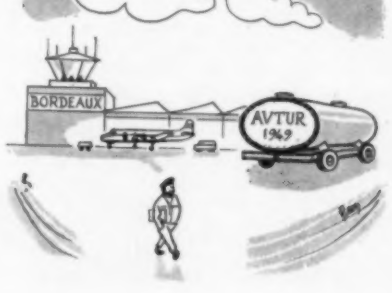
PanAm plan to increase their transatlantic cargo capacity this year by 35 per cent over 1955—double the 1954 figure. Some 5,000 tons are expected to be carried this year.

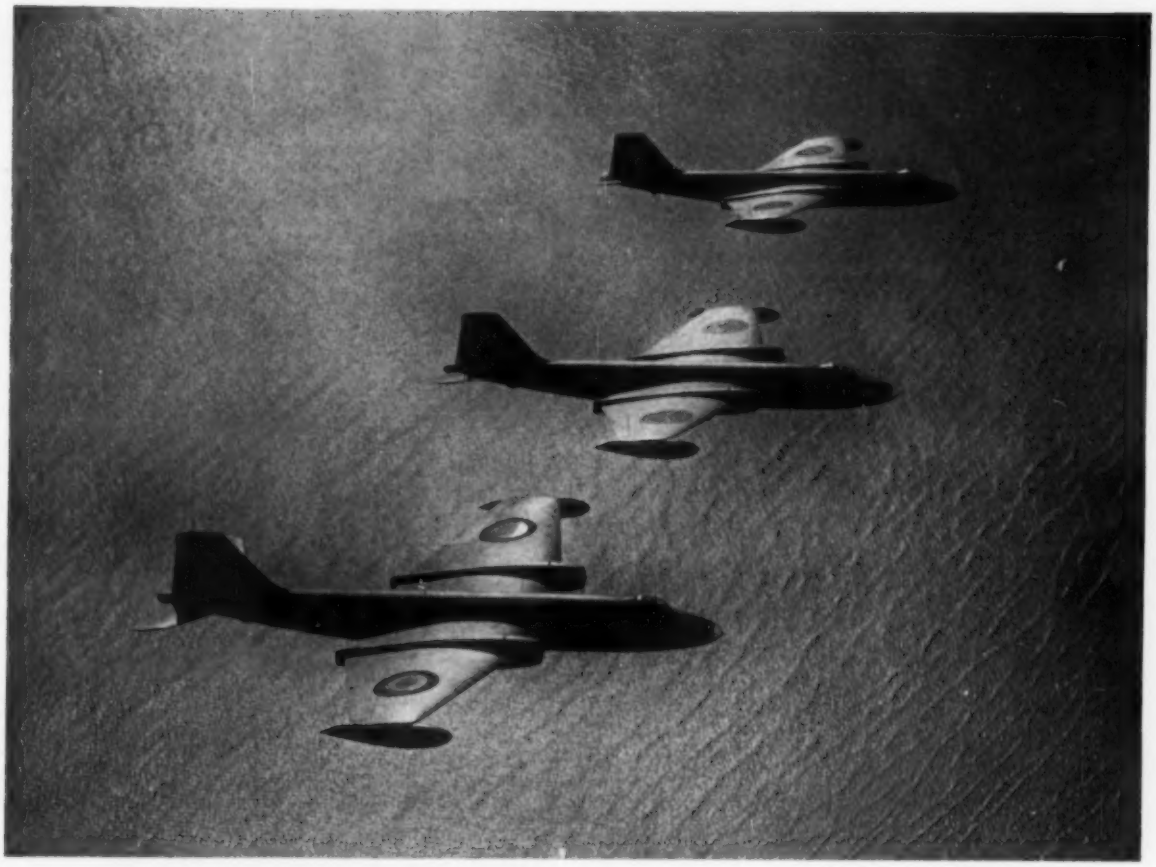
* * *

Silver City Airways report that in 1955 they carried 57,101 vehicles and 166,219 passengers on their English Channel and Irish Sea air ferry services in the course of 23,718 individual flights. The airline also announces a ten per cent fare cut on the Irish air ferry service.

* * *

Operated by Skyways on behalf of B.O.A.C., the once-weekly Hermes freight service between London and Singapore will, from February 2nd, include two new stops—Frankfurt and Milan.





The play of light on the aircraft and the sea below give a particular appeal to this "Flight" photograph of Canberra B.6 light bombers of Nos. 109 and 139 Squadrons.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Air Commodore Appointments

TWO Air Commodore appointments are announced—G/C. Arthur Llewellyn Derry, C.B.E., as Director of Personnel (B) at Air Ministry, with acting rank of air commodore; and G/C. Melvin Kenneth Drowley Porter, C.B.E., as Chief Signals Officer, H.Q., Fighter Command, with acting rank of air commodore.

Air Commodore Derry was educated at Midland College, Leicester, and commissioned in 1925. At the outbreak of war he was at H.Q. Balloon Command and in 1944 was posted to H.Q. Allied Expeditionary Air Force. After service at Air H.Q., West Africa and H.Q., Reserve Command, he became a Deputy Director of Manning at Air Ministry in 1949 and in 1952 Chief Accounts Officer at H.Q., Far East Air Force. For the past year he has been Group Captain (Organization), H.Q., Home Command.

Air Commodore Porter was awarded a R.A.F. College cadetship in 1931 after training as an R.A.F. apprentice. After flying and signals duties he became Chief Signals Officer at H.Q., Balloon Command, and No. 11 (Fighter) Group early in the war, and later served at H.Q., No. 83 Group, H.Q., 2nd Tactical Air Force and H.Q., Bomber Command. After duty at Air Ministry he went to the Middle East as Senior Technical Staff Officer, No. 205 Group, and returned two years later to command Air Signallers' Schools. Before going to Fighter Command he was Chief Signals Officer with the 2nd Tactical Air Force.

Royal Air Force Appointments

THE following are among recent Royal Air Force appointments announced by the Air Ministry:—

G/C. L. H. Anderson, to the War Office, for air staff duties; G/C. E. Knowles, M.B.E., to H.Q., Technical Training Command, for air staff duties; G/C. G. J. L. Read, A.F.C., to Air Ministry, for duty in the department of the Air Member for Personnel; G/C. E. A. Stockwell, to R.A.F. Halton, for administrative duties; G/C. B. S. Cartmel, O.B.E., to H.Q., Bomber Command, for administrative staff duties; G/C. C. F. Harrington, to Headquarters, No. 42 Group, for air staff duties; G/C. A. B. Holloway, C.B.E., to H.Q., 2nd Tactical Air Force, for administrative staff duties.

W/C. E. J. Andrews, O.B.E., to H.Q., Fighter Command, for technical staff duties; W/C. A. F. Binks, D.F.C., to R.A.F. West Malling, for flying duties; W/C. R. Brown, M.B.E., D.F.M., to Headquarters, Bomber Command, for technical staff duties; W/C. R. G. Knott, D.S.O., D.F.C., to R.A.F. Little Rissington, for flying duties; W/C. J. L. Nunn, D.F.C., to R.A.F. Topcliffe, for flying duties; W/C. F. L. Petch, to Air Ministry, for duty in the department of the Air Member for Supply and Organization; W/C. A. K. Hunter, O.B.E., to No. 1 School of Technical Training, Halton, as Senior Technical Officer (with the acting rank of group captain); W/C. A. G. Conway, D.F.C., to the R.A.F. Staff College, Andover, for directing staff duties; W/C. J. E. S. Hill, D.S.O., to R.A.F. Horsham St. Faith, for flying duties; W/C. J. T. Main, O.B.E., to H.Q., Maintenance Command, for technical staff duties; W/C. P. N. Sowman, to H.Q., Far East Air Force, for administrative staff duties; W/C. E. B. Symonds, to Headquarters, Far East Air Force, for technical staff duties.

S/L. W. L. Farquharson, D.F.C., to R.A.F. Worksop, for flying duties (with the acting rank of wing commander); S/L. D. G. Roberts, M.B.E., M.M., to No. 20 (Field) Wing, R.A.F. Regiment, to command (with the acting rank of wing commander); S/L. B. J. Scandrett, A.F.C., to H.Q., Fighter Command, for air staff duties (with the acting rank of wing commander); S/L. W. T. Dunlop, to H.Q., Maintenance Command, for technical staff duties (with acting rank of wing commander); S/L. P. E. Mitchell, to the Royal Air Force Technical College, Henlow, for technical duties.

SERVICE AVIATION . . .

Squadron Flying Clubs

THE next few weeks will see the beginning of operations by a second R.A.F. squadron flying club—that of No. 61 Squadron, stationed at Upwood, Hunts. The instructors will be Canberra pilots of the unit and the trainees will be airmen members. Chairman is the squadron commander, S/L. N. L. Hartley. Money to buy two Tiger Moths was contributed by officers and airmen and the club already has about 30 members, a figure which it is hoped to double.

The first R.A.F. squadron flying club was formed by No. 47 Squadron at Abingdon, Berks, just over a year ago. Under the chairmanship of the squadron commander, S/L. D. P. Boulnois (who holds the A.1 flying instructor's category of the Central Flying School), this club logged 340 hours' flying during 1955. Seventeen members—mostly ground tradesmen with no previous flying instruction—flew solo and five progressed further to gain the private pilot's licence. They included a cook's assistant, two corporals in technical trades, a navigator and an Army captain. Among those who reached the solo stage was a mother of four children—the wife of a flight sergeant. The club has recently adapted its Tiger Moth for glider towing, and it will be available to give towed launches to the gliding club which is shortly to open at R.A.F. Bicester, Oxon. During the year the club reduced its charges from 30s to 27s 6d an hour—about half the rate charged by most private flying clubs.

"Shiny Twelfth" Congratulated

KNOWN throughout the R.A.F. as the "Shiny Twelfth," No. 12 Squadron lately received congratulatory messages from the Commander-in-Chief, Far East Air Force, Air Marshal Sir Francis Fressanges, and the Air Officer Commanding, Malaya, A.V-M. W. H. Kyle, for its Canberra bomber operations against the terrorists. "I would like to congratulate you on the effort you and your squadron have put up in the recent intensive operations against the Communist terrorists," the C-in-C. signalled to No. 12 Squadron's commander, S/L. F. D. C. Wright, D.F.C. "You have upheld highest traditions of the Royal Air Force in the skill with which you have conducted these operations. My heartiest congratulations."

A signal to the squadron from the A.O.C., Malaya, who directs air operations in the Federation, read: "Now that the intensive operations on which you have recently been engaged have been completed, I want all members of your squadron to know that the very hard work and efficient standard of operations was well worth while and that their efforts were very much appreciated."

No. 12 Squadron, which succeeded No. 617 Squadron (the "Dam Busters") in Malaya, maintained a heavy bombing effort every day for eight days, the Canberras making one or more strikes a day during joint air-ground operations in Negri Sembilan. S/L. Wright, who has completed 16 operations since the squadron's arrival in Malaya, will soon be returning to the United Kingdom.

Wearing her Sash of Merit as the best all-round cadet of the 36th Officer Cadet Training Unit, W.R.A.F., is F/O. Doreen Varcoe. The reviewing officer was Air Chief Marshal Sir John Whitworth Jones.

R.A.A.F. Tropical Exercises

ALL fighter, bomber, maritime and transport squadrons of the Royal Australian Air Force will take part in tropical exercises at Darwin or Townsville throughout this year. Tropical trials of the Avon-Sabre, which were begun at Darwin last year, will be continued at Garbutt, near Townsville, where there will be increased activity generally. Six Avon-Sabres from the R.A.A.F.'s Trials Flight at Williamtown, near Newcastle, N.S.W., should by now have arrived at Garbutt. At least three squadrons are scheduled to visit Garbutt from southern bases, including No. 11 Maritime Squadron, operating P2V-5 Neptunes. No. 10 Maritime Squadron, operating "long-nosed" Lincolns, is permanently based at Garbutt. Citizen Air Force units from Melbourne (No. 21) and Adelaide (No. 24) will fly their Vampires to Garbutt, and No. 25 (City of Perth), No. 23 (City of Brisbane) and No. 22 (City of Sydney) Squadrons will visit Darwin.

54 Squadron History

A COMPLETE history of No. 54 Squadron, R.A.F., from its formation at Castle Bromwich in 1916, is being compiled. Much information has already been collected, but we are informed by S/L. W. J. Stacey, the officer commanding, that some fairly large gaps remain to be filled in. S/L. Stacey asks former members of the squadron to send him at R.A.F. Station Odiham, Basingstoke, Hants, any photographs, anecdotes or appropriate information. Material will be returned, if desired, as soon as copies have been made.

R.N.Z.A.F. Catalinas

THE New Zealand Minister of Defence, the Hon. T. L. Macdonald, has announced that the Royal New Zealand Air Force is to dispose of its six Catalina flying-boats. These became surplus to requirements when reconditioned Sunderlands were received. Mr. Macdonald stated that the Catalinas had been retained as a reserve but the cost of preserving them in serviceable condition was no longer warranted. It would cost about £30,000 to refit each aircraft.

Reunions

THERE will be a reunion of the R.A.F. and R.A.F.V.R. Equipment Branch on February 28th. Those interested should write to R. H. Cain, Greenhayes, Tilford Road, Farnham, Surrey.

A reunion of United Kingdom members of No. 458 (R.A.A.F.) Squadron will take place in London on February 25th. All enquiries to R. Murrell, 13 Lovell Road, Enfield, Middx.

Two recent ceremonies: (Left) Air Chief Marshal Sir George H. Mills signs the General Order on his recent assumption of command of Allied Air Forces Central Europe; on the left is Lt.-Col. Eldon Downs, U.S.A.F, acting adjutant general, and on the right Air Marshal H. P. Fraser, Chief of Staff. The right-hand picture shows the Chief of Air Staff of the R.N.Z.A.F. (A.V-M. W. H. Merton) presenting, for the first time, the Sword of Honour which he has donated to the R.N.Z.A.F. The recipient is A.P/O. J. S. Boys.

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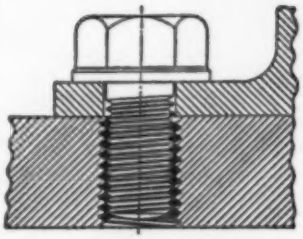

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

APPLICATION No. 700. From Fairways (Jersey), Ltd., of St. Peters Airport, Jersey, Channel Islands, for an All Freight Service to be operated with Avro XIX aircraft for the carriage of freight only between Jersey (St. Peters) and Southampton and/or Blackbushe and/or Croydon and/or Birmingham (Elmdon) at a frequency of up to 15 return flights monthly, increasing according to traffic demand, for a period of seven years commencing immediately after date of approval.

FROM: British European Airways Corporation of Keyline House, Ruislip, Middlesex:—

APPLICATION No. 701. For an amendment to the Normal Scheduled Service which the Corporation are authorised to operate on the route London-Oslo (Route No. 28 in Schedule 'A', part II, of the Terms of Reference issued to the Council by the Minister of Civil Aviation on 30th July, 1952), so as to include an optional traffic stop at Gothenburg.

APPLICATION No. 702. For permission to omit at their discretion the terminating stop at Malta on the Normal Scheduled Service which the Corporation are authorised to operate until 23rd March, 1961 on the route London-Nice and/or Rome or Naples-Malta, so as to operate a service London-Naples.

APPLICATION No. 704. For permission to omit at their discretion the terminating stop at Stockholm on the All Freight Service which the Corporation are authorised to operate on the route set out as Route No. 2 in Schedule 'B' of the Terms of Reference, so as to operate London-Amsterdam-Hamburg-Copenhagen.

FROM Wessex Airways, of 14, Southernhay West, Exeter, for the following U.K. Internal Services to be operated with D.H.89A and/or D.H. Doves and D.H. Herons according to sector and later possibly with Twin Pioneer aircraft, for the carriage of passengers, supplementary freight and mail at frequencies increasing according to demand for a period of 10 years commencing 15th April, 1956, and with permission to integrate all the services at the discretion of the Company:—

APPLICATION No. 705. For a service between the Scillies and/or Penzance and/or Plymouth and Exeter or Bristol at an initial frequency of up to eight return flights weekly to Exeter and up to four return flights weekly to Bristol. No traffic to be carried between Penzance and the Scillies except with B.E.A. agreement.

APPLICATION No. 706. For a service between Cardiff and Exeter and/or Plymouth and/or Penzance at an initial frequency of up to eight return flights weekly.

APPLICATION No. 707. For a service between Swansea and Exeter and/or Plymouth and/or Penzance at an initial frequency of up to four return flights weekly.

APPLICATION No. 708. For a service between London (Croydon) and Plymouth via Exeter (optional stop) at an initial frequency of up to eight return flights weekly.

APPLICATION No. 709. For a service between Birmingham (Elmdon) and Exeter and/or Plymouth at an initial frequency of up to four return flights weekly.

APPLICATION No. 710. For a service between Liverpool (Speke) and Exeter and/or Plymouth at an initial frequency of up to four return flights weekly.

APPLICATION No. 711. For a service between Manchester (Ringway) and Exeter and/or Plymouth via Bristol (optional stop) at an initial frequency of up to four return flights weekly.

APPLICATION No. 712. From Air Kruise (Kent) Ltd., of 1, Great Cumberland Place, London, W.1., for a Seasonal Inclusive Tour Service to be operated with Dakota or Bristol 170 aircraft in conjunction with Blue Cars (Continental) Coach Cruises Ltd. for the carriage of pasengers and supplementary freight between Lydd and Jersey, at a frequency of from one to two return flights each Saturday during the period from 19th April to 15th September, 1956.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1., from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [4757

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PUBLIC APPOINTMENTS

COUNTY BOROUGH OF WEST HARTLEPOOL

WEST HARTLEPOOL (TEES-SIDE) MUNICIPAL AERODROME AT GREATHAM

APPOINTMENT OF AIRPORT MANAGER

The Council of the County Borough of West Hartlepool invite applications for the position of Manager of their aerodrome at Greatham, 2½ miles from the centre of West Hartlepool, and which at present is a grass airfield 218 acres in extent equipped with VHF/DF wireless and perimeter night lighting.

Candidates should have had experience in the flying of aircraft and the operation of aerodromes and the successful applicant will be expected to have the initiative and interest necessary to assist the future development of the aerodrome.

The salary offered is a minimum of £800 per annum and a maximum of £1,000 per annum and the commencing salary will be determined according to the ability and experience of the person appointed. Free unfurnished housing accommodation including lighting, heating and water will be provided at the aerodrome.

The Local Government Superannuation Acts will apply and the successful candidate must pass a medical examination. The appointment will be terminable by three months' notice on either side.

Applications in writing giving full particulars and the names of three referees should be received by me not later than the 6th February, 1956.

ERIC J. WAGGOTT,
Town Clerk.

MUNICIPAL BUILDINGS,
WEST HARTLEPOOL. [4727

MINISTRY OF SUPPLY, Royal Aircraft Establishment, Naval Air Department, Bedford, requires Mechanical Engineers for experimental work relating to catapulting and arresting landing of Naval Aircraft (experience in stress office of aircraft industry may be an advantage). Ref. C8/6a/EY.

APPLIED Mathematicians or Physicists to assist in theoretical investigations concerning design of future Naval aircraft and their operation from carriers. Ref. A7/6A/EY. Quals.: G.C.E.(A), or equivalent in mathematics and physics, or H.N.C. or equivalent in Mechanical Engineering. Appointment according to age, experience, etc., as Experimental Officer (min. age 26) salary range £745—£920 or Assistant Experimental Officer, £306 10s. (age 18) to £670. Houses may be available for married candidates. Opportunities for further education. Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting appropriate ref. no. [4737

EXPERIMENTAL Officer required at Ministry of Supply Experimental Establishment near Amesbury, Wilts., for technical duties concerning flight assessment of handling and performance characteristics of military aircraft. Work includes liaison with firms in their flight development, followed by planning and interpretation of flight trials. Quals.:—H.S.C. (Science) or equivalent but H.N.C. or degree in Physics, Maths, or Engineering may be advantage. Appropriate experience desirable. Salary within range (min. age 26) £745-£920. Occasionally a limited number of houses become available for married candidates. Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A15/6A/EY. Closing date 17 February, 1956. [4758

THE Royal Aircraft Establishment, Farnborough, Hants. Engineer required by Ministry of Supply to assist in design, construction and development of a large high speed shock tube, and its subsidiary equipment, for use in the Supersonic Section of Aero. Department. Duties: Design and control of experimental apparatus involving high pressures and temperatures and containing explosive gases. Qualifications: Higher School Certificate (Science) or equivalent. A sound knowledge of mechanical engineering with careful approach to the work essential. Familiarity with some of the following may be an advantage: High pressure pipes, valves and cylinders; explosives and burning of gaseous mixtures; vacuum techniques. Appointment as Experimental Officer (min age 26) with salary according to age, experience, etc., in range £745—£920. Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, S.W.1, quoting C.1/6A/EY. Closing date February 10th, 1956. [4736

MIN. OF SUPPLY require Physicists, Electrical Engineers and Mathematicians for outstation of Royal Aircraft Estab. near Bedford (but at Woodbridge, Suffolk for initial period) for work on problems of all-weather and rapid landing of aircraft. Duties involve design and assessment of full-scale flight experiments in blind approach and landing, and liaison with appropriate civilian and service authorities. Candidates should have 1st or 2nd class hons. degree in Physics, Maths. or Electrical Engineering, with some experience in electronics or aerodynamics. Familiarity with R.A.F. organisation and procedure an advantage. Houses available for rental at Bedford within reasonable period to successful married candidates. Salary within ranges, Senior Scientific Officer (min. age 26)—£1,030—£1,185; Scientific Officer (min. age 21)—£488 10s.—£885 (superannuable). At least 3 years post graduate research experience required for S.S.O. Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting A2/6A/EY. [4744

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(e) **ENGINEERS TO BE EMPLOYED ON INTERCHANGEABILITY IN THE PRODUCTION ENGINEER'S DEPARTMENT.** Applicants are expected to work on their own initiative, in liaison with the aircraft design, jig and tool design, Planning and Inspection Departments. The work includes from provisioning of interchangeability media, to application and proof assembly of components.

(f) **TECHNICAL ENGINEERS ON RESEARCH WORK.** Applicants should have an Engineering, Physics or Mathematics degree or Higher National Certificate. Aeronautical experience is also desirable in structural stressing, aeroelasticity and/or stability and control.

(g) **PROCESS PLANNING CLERKS** (preferably with some engineering background) to assist Planning Engineers in compiling production programmes for detail work, subassemblies, etc.

The Company will be interested also in considering applications from other experienced Technicians and Tradesmen in occupations applicable to the Aircraft Industry.

Applications, quoting date and prefix letter of advertisement, to: **Employment Manager, Vickers-Armstrongs (Aircraft) Limited, Weybridge Works, Weybridge, Surrey.**

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ELECTRICAL Engineer (min. age 26) required by Ministry of Supply Experimental Establishment near Amesbury, Wilts, to undertake development work in connection with instrumentation for engineering flight test measurements. Quals.:—Higher School Certificate (Science) or equivalent, but possession of H.N.C. or pass degree in Electrical Engineering may be an advantage. Experience of aircraft test instrumentation essential. Some knowledge of temperature measurement and modern recording equipment would be an advantage. Salary within Experimental Officer range £745-£920. Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting D 15-6A/EY. Closing date 10 February, 1956. [4749

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Lockheed Hydraulic Brake Co., Ltd., Leamington Spa,

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Applicants should possess an engineering degree or be eligible for membership of a recognised engineering institution and have had about 5 years engineering experience preferably in the automobile field. In addition they must have drive, initiative, a flair for original design, and the ability to direct the requirements of development testing.

These are senior appointments and the commencing salary will be commensurate with experience and qualifications.

Applications, in strictest confidence, should give full details of qualifications, experience and positions held, with salary, to:—

Personnel Officer,
Lockheed Hydraulic Brake Co., Ltd., Tachbrook Road, Leamington Spa.

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Details of age, experience, qualifications and present salary, would be appreciated when applying to The Personnel Manager, Bristol Aircraft Limited, Filton House, Bristol, quoting L.D.O./JF.14

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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A vacancy exists for a Senior Engineer as a Deputy to the Chief Dynamics Engineer of a major organisation in the Guided Weapons Industry.
Applicants must have completed an apprenticeship with a well known firm and should have a minimum of five years experience on Research or Development work; preferably with some experience of vibration or climatic testing.
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Two Technicians are required for Dynamic and Climatic investigations which cover a wide variety of problems.
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All replies should be addressed to:—
Technical Appointments Officer,
Sir W. G. Armstrong Whitworth Aircraft, Ltd.,
Baginton, Nr. Coventry.
Quoting reference ARM/TAO. [4760

TEST and Laboratory Engineers required for gyro and electro mechanical instruments. Apply stating age, experience and salary required to S.G. Brown, Ltd., Shakespeare Street, Watford, Herts. [0147

SITUATIONS VACANT

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VACANCIES exist in an established and progressive Aircraft Company situated in the Home Counties for Weight Control Engineers. Only experienced men need apply, stating age, experience and existing salary. Interviews can be arranged for evenings and Saturdays and at the applicant's own home if desired. Reply in confidence to Box ME 2804, A.K. Advg., 212a Shaftesbury Ave., London, W.C.2, under reference WE/6. [4704

RESEARCH ENGINEERS

THE Parsons and Marine Engineering Turbine Research and Development Association have a number of vacancies in their Research Department. The work covers all aspects of steam and gas turbines, gearing and transmission for marine propulsion, and affords an excellent opportunity for gaining experience in the latest practice in these fields. Previous experience with turbines, gearing, lubrication, aerodynamics, combustion or vibration problems is desirable but not essential, and newly-graduated candidates will be considered as well as older men. Applicants, who should be of degree standard, will be expected to exercise initiative and undertake responsibility, and the salary scales are commensurate with these requirements. Salaries are subject to annual review. There are also substantial additional benefits including superannuation. Applications in writing should be addressed to the Research Director, Pametrada Research Station, Wallsend, Northumberland. [4735

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Please reply, stating age, and particulars of past record, to Managing Director, Aero Research, Limited, Druxford, Cambridge. [4719

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APPLICATIONS are invited from suitably qualified persons for the position of Operations Officer, Wellington. Qualifications desired: recent experience as a pilot with not less than 1,000 hours in command of multi-engined aircraft. Degree in science or engineering or Associate Fellowship of the Royal Aeronautical Society an advantage.
FURTHER details and application forms may be obtained from the High Commissioner for New Zealand, 415 Strand, London, W.C.2, mentioning this paper and quoting reference No. 3/47/22 (1768), completed applications to be lodged not later than February 11th, 1956. [4739

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1. Skilled Airframe Fitters
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Personnel Department,
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Nr. Winchester. [4693

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Apply to:

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SITUATIONS VACANT

NOISE AND VIBRATION RESEARCH

THE Parsons and Marine Engineering Turbine Research and Development Association require a Section Leader for the Applied Physics Section, which is concerned mainly with research into the problems of noise and vibration in marine machinery. The work includes theoretical analysis and the running of various research rigs in addition to taking measurements at sea. Applicants should be of degree standard or equivalent and should preferably have some previous experience of vibration work, not necessarily marine. The successful candidate will be expected to undertake a considerable degree of responsibility and will be in charge of a number of graduate engineers and physicists. The starting salary depends on age and qualifications but is fully commensurate with these duties and is subject to annual review. The post also carries other substantial benefits including superannuation. Applications in writing, stating age and experience, should be addressed to the Research Director, Pametrada Research Station, Wallsend, Northumberland. [4734

FLYING Instructor required. Permanent and house available. Details:—Blackpool & Fylde Aero Club, Blackpool Airport. [4754

ROCKET Division of Armstrong Siddeley Motors has following vacancies for Mechanical Engineers with qualifications stipulated:

(1) Mechanical Engineering Graduates or equivalent required for work connected with design and development of test equipment for liquid propelled rocket engines. This work covers a wide range of engineering problems, and offers good prospects to men of the right calibre.

(2) Electronic Engineers for work on design and maintenance of electronic recording gear in connection with testing of engines. Applicants for these positions should hold at least a H.N.C. in Electrical Engineering and have some experience of electronic apparatus. The positions are on the Technical Staff and pensionable. Good working conditions. Free transport from Coventry to works and canteen facilities. Application quoting reference RD/Mech or RD/Elect as appropriate to Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [0464

NAVIGATION Instructor. Ground Instructor required by Air Service Training, Limited, Hamble, Southampton. For conditions of appointment apply to the Commandant, giving details and experience. [4743

CAPTAIN required for Dakota and Marathon aircraft. Minimum qualifications Senior Commercial and Instrument Rating. Apply Chief Pilot, Derby Aviation, Ltd., Burnaston, Airport, Derby. [4712

HONG-KONG AIRWAYS, LIMITED, require an Operations Manager/Chief Pilot. Duties—complete responsibility all operational activities including operation of Viscount 700D aircraft. Qualifications and experience required:—

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FLYING instructor/secretary required by Jersey Aero Club. Limited living accommodation at Club House. Applicants must be prepared to accept low basic salary augmented by commission on all receipts. Write to R. W. Spears, Rutland House, Charing Cross, Jersey, C.I. [4738

SCOTTISH AVIATION urgently require Aircraft Planning Engineers. Applicants should have served an Engineering Apprenticeship and have previous experience on Planning Processes. Applicants should reply, stating experience, etc., to Personnel Manager, Scottish Aviation, Limited, Prestwick Airport, Ayrshire. [4708

WELL known Midland aero engine company requires Mechanical Engineering Designers and Draughtsmen to join teams on various aspects of engine construction. Initial salary £650-£1,000 per annum. Owing to expansion in new drawing offices, with excellent working conditions, departments will offer good prospects to men with initiative. Sickness benefits for families and pension fund. Full details quoting Reference AD/2 to Box 8565. [0467

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STRESS Engineers. A number of Stress engineers are required by Vickers-Armstrongs (Aircraft) Limited at their Hursley Park design offices. The work is interesting, conditions and prospects good and salaries progressive. Previous experience is not essential but a degree or Higher National Certificate must be held. Applications should be addressed to the Personnel Manager, Vickers-Armstrongs (Aircraft), Ltd., Hursley Park, nr. Winchester. [4750

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ARMSTRONG-SIDDELEY MOTORS require technical artist for interesting work on gas turbine engines. Ability to produce perspective sketches from engineering drawings is essential. Experience in the use of an air brush would be an advantage but not essential. Application with full details of education and experience to Reference TA/CG, Technical Personnel Manager, Armstrong-Siddeley Motors Limited, Coventry. [0468

WANTED, draughtsman to design in aluminium for sales development. Must possess Higher National Certificate in Mechanical Engineering. Location Banbury. Good working conditions and pleasant surroundings. Attractive starting salaries offered up to £800 p.a. with prospects of promotion from drawing board. Pension plan in operation. Send brief details of qualifications and experience to Northern Aluminium Co., Ltd., Bush House, Aldwych, London, W.2. [0348

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AIRPORT Depot Supervisor required by major oil company in West Africa. This is an interesting position requiring a man of good personality, who has had sound practical experience in the repair, maintenance, and improvisation of internal combustion engines, small pumps and conventional electric mechanism. Experience in the petroleum industry is not essential but some related experience at an airport desirable. Attractive commencing salary. Applications giving full personal particulars, experience and salary requirements to Box No. 8884 quoting ref. WA/A/20. [4759

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ARMSTRONG-SIDDELEY MOTORS have vacancies in their gas turbine development staff for work on Sapphire and Viper aero engines. Applicants must have a University Degree. Previous experience, although desirable, is not essential. Initial salaries in the range of £600-£1,000 per annum, dependent on age, experience and qualifications. Due to heavy forthcoming commitments and consequent expansion of departments, prospects for men of the right calibre are unusually good. Applications with full details to Reference EXP/SV, Technical Personnel Manager, Armstrong-Siddeley Motors, Coventry. [0460

AN attractive opportunity exists for a limited number of young men to obtain valuable training in the drawing office of a Company specializing in Aircraft Hydraulic Systems and Controls. The Company has available comprehensive educational facilities, and having wide interests in the automotive and general industries, offers an unusual scope in its particular field. Men who have recently completed their national service, or who are nearing release, are in particular invited to write giving an outline of their experience and activities to The Personnel Officer, Lockheed Hydraulic Brake Co., Ltd., Leamington Spa, Warwickshire. [4698

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DESIRABLE Qualifications—Sound technical knowledge preferably supported by appropriate academic qualifications. Initiative, special interest in development and several years' experience in the radio field are essential. A thorough knowledge extending over electrics generally an advantage. Salary £905 to £1,120 per annum. Excellent pension, insurance, sickness and holiday entitlements, sports and social club facilities.

APPLY in the first instance, giving full details of experience to Assistant Staff Manager (Appointments), B.O.A.C., London Airport. [4732

ROCKET Division of Armstrong Siddeley Motors has really good vacancies for designers and draughtsmen intent on furthering their career in this new branch of propulsion. Applicants must have had minimum of three years drawing office experience and preferably hold at least a Higher National Certificate in Mechanical Engineering. Drawing office experience however is preferable to academic qualifications. Due to new projects and consequent expansion of departments prospects for men of the right calibre are unusually good. This is a fine opportunity to enter on the ground floor of new and fascinating work with far reaching implications. Initial salary range £13 10s. to £16 10s. per week. Apply for a personal interview with our Chief Designer, Rocket Division by writing to Technical Personnel Manager, Armstrong Siddeley Motors, Coventry, quoting reference RD/DD. [0469

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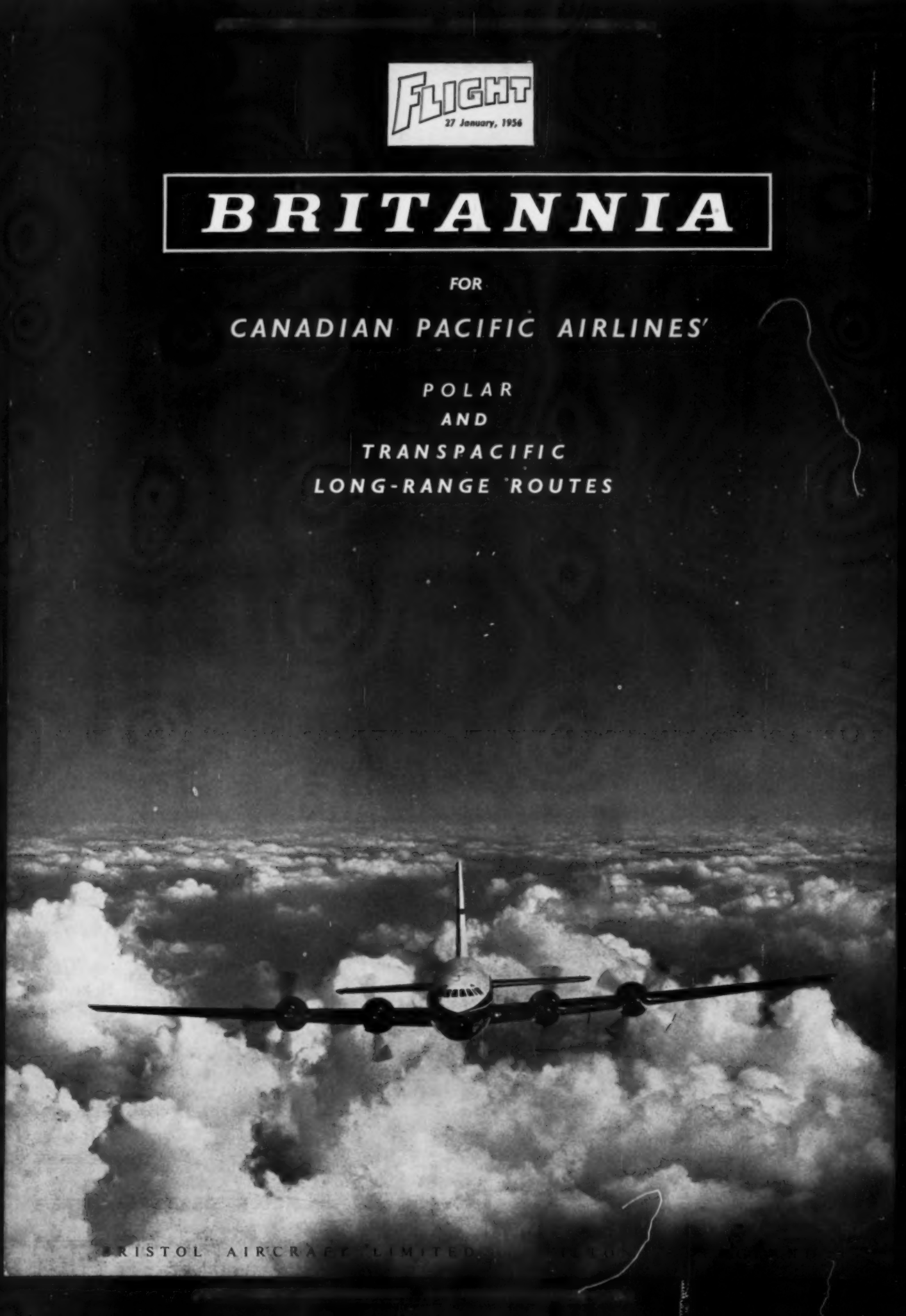

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